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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 9] [1923

XXXII.—THE GENUS PANICUM OF THE FLORA AUSTRALIENSIS.

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When the *Paniceae* were revised by Dr. O. Stapf for the Flora of Tropical Africa, he recognised, as do most modern authors, the expediency of adopting smaller genera with well-defined limits, rather than retaining them as groups of the enormous and unwieldy genus *Panicum*. The arrangement in the Kew Herbarium of the African material on these lines also entailed the examination of similar groups from other parts of the world. The group affording the greatest difficulty, perhaps, consisted of all the species enumerated under *Panicum* by Bentham in the Flora Australiensis. Since that great work was published, further collections have been added to the Herbarium. Of these, much material was incorrectly or only partially named and the morphology incompletely studied, and much was new.

The work given here, which is an outline of a more extensive paper intended for later publication, contains an enumeration of all the specimens of the group at present in the Kew Herbarium and at the British Museum, with Keys to the genera and species based, as far as possible, on fundamental characters. Numerous notes have been made on morphology, literature and geographical distribution, but these, together with drawings of the types, are being held over until the writer has had an opportunity of amplifying them during a forthcoming visit to some of the Herbaria in the United States.

It must be remembered that the group under consideration is limited strictly to *Panicum* as understood by Bentham, and that allied plants which he placed in other genera are not considered here. The Key, as a synopsis of the Australian Genera of *Paniceae*, is therefore incomplete, and the sequence of the genera not exactly in accordance with their true taxonomic relationship. Thus, for instance, the genus *Paractaenum* is placed in the Key after *Echinochloa*, but its true affinity is with

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Plagiosetum in the *Cenchrastrae*, a genus already recognised as distinct in the Flora Australiensis, and therefore not included in the Key. Two species have been moved from *Paspalum* to *Digitaria*, viz. *Paspalum brevifolium* Fluegge to *Digitaria longiflora* Pers. and *Paspalum minutiflorum* Benth. non Steud. to *Digitaria recta* Hughes, as the account of *Digitaria* would not have been complete had these two species been omitted.

Key to the Genera.

Fertile floret glabrous, smooth and shining or rugose :

*Fruiting valve cartilaginous indurated or crustaceous; inflorescence an open panicle or composed of simple or compound racemes :

Fruiting valve with usually flat, thin to hyaline margins, thinly cartilaginous, with the usually minute, often microscopic, scale-like valvule of the barren floret attached to its base :

Inflorescence of digitate or subdigitate (rarely solitary) racemes, these longer than the main axis :

Spikelets, including the fertile valve, awned; racemes stout - I. **Alloteropsis.**

Spikelets awnless; racemes slender II. **Digitaria.**

Inflorescence an open panicle - III. **Leptoloma.**

Fruiting valve with more or less inrolled margins, usually crustaceous; valvule of the barren floret, if developed, not attached to the false fruit :

Inflorescence of racemosely arranged simple or compound racemes :

Back of fruit abaxial - - IV. **Brachiaria.**

Back of fruit adaxial :

Rhachis of racemes persistent on the main axis; spikelets falling off singly :

Glumes neither awned nor caudate, or if shortly cuspidate acuminate, then the fruiting valve obtuse with an imposed mucro and the margins inrolled all along :

Fruiting valve acute or acuminate, not mucronate; spikelets sometimes subtended by a bristle, or the racemes often ending in a bristle - - - V. **Paspalidium.**

Fruiting valve obtuse, abruptly mucronate or aristulate; inflorescence without bristles - - VI. **Urochloa.**

Glumes caudate, or cuspidate acuminate, or awned; margins of the fruiting valve flat upwards, not embracing the tip of the valvule - - VII. **Echinochloa.**

Racemes disarticulating at the base from the main axis and falling off with the spikelets - VIII. **Paractaenum.**

Inflorescence an open panicle or contracted and spikelike:

Spikelets not gibbous; inflorescence an open panicle:

Fertile floret without any basal appendages - - - IX. **Panicum.**

Fertile floret with basal appendages in front - - - X. **Ichnanthus.**

Spikelets gibbous:

Spikelets in panicles; fertile floret laterally much compressed XI. **Cyrtococcum.**

Spikelets in cylindrical false spikes; fertile floret not distinctly laterally compressed - XII. **Sacciolepis.**

Fruiting valve membranous; inflorescence a dense contracted and often spikelike panicle - - - XIII. **Hymenachne.

Fertile floret distinctly villous or villosulous, cartilaginous or membranous - - XIV. **Entolasia.**

Enumeration.

(A mark ! denotes the type of the Species.)

I. Alloteropsis *Presl.* emend. *Hitchc.* in Contrib. U. S. Nat. Herb. xii. 210 (1909).

A. semialata (*R. Br.*) *Hitchc.* l.c.; *Panicum semialatum* R. Br. Prod. 192 (1810); Benth. Fl. Austral. vii. 472; *P. viaticum* Griff. Ic. Pl. As. t. 145 (1851), f. 2; *Urochloa semialata* Kunth. Rev. Gram. i. 31 (1839); *Oplismenus semialatus* Desv. Opusc. 81 (1831); *Coridochloa semialatus* Nees in Edinb. New Phil. Journ. xv, 31 (1833); *Aira viatica* Griff. Not. iii. 54 (1851); *Holosetum philippicum* Steud. Syn. Pl. Glum. 118 (1854); *Arundinella Schultzii* Benth. Fl. Austral. vii. 545 (1878).

W. Australia: Escape Cliffs, *Hulse.*

N. Territory: Victoria River, *Mueller*; Port Darwin, *Schultz* 31, 662, 784, 801; near Darwin, *Allen* 10, 47, 70, 162,

163; Carpentaria, *Brown*!; Port Essington, *Armstrong* 510, 546; between Providence Hill and McAdam Range, *Mueller*.

QUEENSLAND: Sweers Island, *Henne*; Rockingham Bay, *Dallachy*; Herbert's Creek, *Bowman*; Keppel Bay, *Brown*!; Port Curtis, *McGillivray*; Moreton Island, *McGillivray*; and without precise locality, *Leichhardt*.

N.S. WALES: near Richmond River, *Strange*; Clarence River, *Strange*; Liverpool Plains and Endeavour River, *Cunningham*; Warialda, *Hadley*.

II. **Digitaria** *Hall.* Hist. Stirp. ii. 244 (1768).

*Racemes sessile or subsessile, or if bare at the base, then with traces of arrested spikelets:

Spikelets sparingly pubescent or glabrous:

Rhachis of racemes stout, laterally winged or margined; spikelets 4–4·8 mm. long; these, or at least the upper of each pair, with coarse, rigid, tubercle-based hairs on the lateral nerves of the lower floret:

Racemes 2, about 8 cm. long; spikelets 4·5–4·8 mm. long; culms weak; plants up to about 30 cm. high - - - - 1. *ctenantha*.

Racemes 3 or more, 16–18 cm. long; spikelets 4 mm. long; culms robust; plants 50 cm. or more high - 2. *robusta*.

Rhachis of racemes slender to filiform; spikelets 1·5–3·5 mm. long; hairs different:

Upper glume 5-nerved, equalling the spikelet in shape and size:

Lower glume minute or obsolete:

Racemes 2–3, approximate, slender, flexuose, up to 12 cm. long; spikelets pale and finely pubescent - - - 3. *longiflora*.

Racemes several, spreading, 3–7 cm. long; spikelets dark, apparently glabrous - - 4. *striata*.

Lower glume larger, about 6 mm. long:

Spikelets 2 mm. long, glabrous 5. *parviflora*.

Spikelets 2·5 mm. long, softly pubescent - - - - 6. *Baileyi*.

Upper glume usually 3-nerved, slightly or conspicuously shorter and narrower than the spikelet:

Upper glume narrow, lanceolate or ovate-lanceolate, 3-nerved, equalling more than half the length of the spikelet :

Spikelets 2·7–3·5 mm. long :

Lateral nerves of the lower valve gathered to the margins, leaving a wider space on either side of the middle nerve; racemes usually numerous; plants coarsely hirsute :

Spikelets acuminate, glabrous or pubescent; nerves of the lower valve smooth — 7. *marginata.*

Spikelets acute or rather less acuminate than in *D. marginata*; nerves of the lower floret scabrid or scaberulous — 8. *sanguinalis.*

Nerves of the lower valve closely and evenly distributed; racemes 2–3; plants slender, glabrous — 9. *stenostachya.*

Spikelets 1·5–2 mm. long :

Culms about 3-noded; leaves lanceolate, flat, up to 15 cm. long; racemes several, 5–12 cm. long — 10. *recta.*

Culms many-noded; leaves crowded, about 2–3 cm. long; racemes 2–4, 3–5 cm. long :

Racemes usually 2; spikelets 2 mm. long — 11. *didactyla.*

Racemes 3–4; spikelets 1·5 mm. long — 12. *tenuissima.*

Upper glume broad, rotundate, equalling about half, or less, the length of the spikelet, nerveless or the middle nerve obsolete :

Lower valve 7-nerved; upper glume 6 mm. long — 13. *diminuta.*

Lower valve 3-nerved; upper glume quite rudimentary — 14. *orbata.*

Spikelets densely hairy; indumentum usually much exceeding the spikelets :

Spikelets gibbous; hairs coarse, rigid, needle-like — 15. *gibbosa.*

Spikelets not gibbous; hairs very fine, soft and woolly — 16. *Brownei.*

**Racemes bare at the base for at least 3 cm. (often for 10 or 12 cm.), the lowest whorled :

Spikelets 2–2·5 mm. long :
Spikelets clothed with long silky hairs up to 2 mm. long - - - 17. *ammophila.*
Spikelets glabrous - - - 18. *tonsa.*
Spikelets 3·5–4·5 mm. long :
Spikelets softly pubescent or glabrous :
Leaves and sheaths woolly pubescent; upper glume as long as the spikelet - - - - 19. *coenicola.*
Leaves and sheaths more or less glabrous or glabrescent; upper glume often slightly shorter and narrower than the spikelet - 20. *divaricatissima.*
Spikelets with tubercle-based hairs along the nerves of the lower valve - 21. *macractenia.*

1. **D. ctenantha** (*F. Muell.*) *Hughes* nov. comb.; *Panicum ctenanthum* F. Muell. Fragm. vii. 153 (1874); Benth. Fl. Austral. vii. 469.

W. Australia : Dampier's Archipelago, *Walcot;* Mons Cupri, Whim Creek, *Mitchell;* Sturt's Creek, *Mueller.*

2. **D. robusta** *Hughes* nov. sp.

Annua, usque ad 60 cm. alta inflorescentia inclusa. *Culmi* erecti vel geniculato-ascendentes, multinodi nodis exsertis glabris inferioribus radicantibus. *Foliorum* vaginae solutae, glabrae, ore longe barbatae ; ligulae ovatae, membranaceae, 1·5 mm. longae, glabrae; laminae planae, circiter 12 cm. longae, 0·4 cm. latae, glabrae vel pilis paucis tenuissimis basi tuberculatis indutae. *Racemi* 3, digitati, usque ad 20 cm. longi; rhachis breviter alata, 0·8 mm. lata. *Spiculae* 2-nae, 4 mm. longae, anguste ovato-oblongae. *Gluma* inferior nulla; superior 3 mm. longa, ovata, acuta, sericeo-hirsuta. *Anthoecium* inferum ad valvam spiculam aequantem 5-nervem reductum nervis lateralibus ciliis rigidis basi tuberculatis indutis. *Anthoecium* superum ♂, anguste ovato-oblongum, albidum.

N. Territory : Melville Island " sandy soil near beach ", *Hill* 189 !.

3. **D. longiflora** (*Retz.*) *Pers.* Syn. i. 85 (1805); *D. tenuiflora* Beauv. Agrost. 51 (1812); *D. Pseudo-Durva* Nees, Fl. Afr. Austr. 21 (1841); *Paspalum longiflorum* Retz. Obs. iv. 15 (1786); *P. brevifolium* Fluegge Monogr. 150 (1810); Benth. Fl. Austral. vii. 461; *Panicum tenuiflorum* R. Br. Prod. 193 (1810); *P. propinquum* R. Br. l. c.; *P. Steudelianum* Domin in Biblioth. Bot. lxxxv. 296 (1915); *Syntherisma longiflora* Skeels in U.S. Dep. Agric. Bur. Pl. Ind. Bull. 261. 30 (1912).

N. Territory : McAdam Range, *Mueller.*

QUEENSLAND: Rockingham Bay, *Dallachy*; Herbert's Creek, *Bowman*.

N. S. WALES: Port Jackson, *Brown* 6122, 6123.

4. **D. striata** (*R. Br.*) *Hughes* nov. comb.; *Panicum striatum* R. Br. Prod. 192 (1810); *P. australe* Spreng. Syst. Veg. i. 309 (1825); *P. parviflorum* Benth. Fl. Austral. vii. 471 (1878) p.p. non R. Br.; *P. Steudelianum* var. *striatum* Domin in Biblioth. Bot. lxxxv. 296 (1915).

N. S. WALES: Port Jackson, *Brown* 6116!.

5. **D. parviflora** (*R. Br.*) *Hughes* nov. comb.; *Panicum parviflorum* R. Br. Prod. 192 (1810); Benth. Fl. Austral. 470.

QUEENSLAND: Brisbane River, *Mueller*.

N. S. WALES: McIntyre River, *Ker*; New England, *Stuart*; Parramatta, *Woolls*; Port Jackson, *Brown* 6117!; and without precise locality, *Mueller*, *Leichhardt*.

6. **D. Baileyi** (*Benth.*) *Hughes* nov. comb.; *Panicum Baileyi* Benth. Fl. Austral. vii. 471 (1878).

QUEENSLAND: Brisbane River, *Bailey*!.

N. S. WALES: Port Jackson, *Brown* 6119 p.p. (mixed with *P. villosum* R. Br. type).

7. **D. marginata** *Link* Hort. Berol. i. 229 (1827); *Panicum sanguinale* Benth. Fl. Austral. vii. 469 (1878) p.p.

W. AUSTRALIA: Leederville, *Stoward* 937; Busselton, *Preis*.

N. TERRITORY: Port Essington, *Armstrong* 593.

QUEENSLAND: Rockhampton, *O'Shanesy*; Brisbane River, *Mueller*.

N. S. WALES: McIntyre River, *Ker* p.p.; New England, Clifton, *Stuart*.

8. **D. sanguinalis** (*Linn.*) *Scop.* Fl. Carn. ed. ii. i. 52 (1772); *Panicum sanguinalis* Linn. Sp. Pl. 57 (1753); Benth. Fl. Austral. vii. 469 p.p.

W. AUSTRALIA: Claremont near Perth, *Andrews* 1188.

N. S. WALES: McIntyre River, *Ker*; Sydney, *McStephenson* 259.

9. **D. stenostachya** (*Benth.*) *Hughes* nov. comb.; *Panicum stenostachyum* Benth. Fl. Austral. vii. 470 (1878).

N. TERRITORY: Upper Victoria River, *Mueller*.

10. **D. recta** *Hughes* nov. sp.

Annua (?), usque ad 60 cm. alta inflorescentia inclusa. *Culmi* erecti vel geniculato-ascendentes, 3-nodi nodis glabris. *Foliorum* vaginae subapertae, glabrae; ligulae membranaceae, truncatae, 1 mm. longae; laminae planae, usque ad 15 cm. longae, 0·4—0·6

cm. latae, glabrae vel basi pilos paucos elongatos gerentes. *Racemi* usque ad 7, alterni vel subdigitati, recti, usque ad 13 cm. longi; rhachis 0·8 mm. lata. *Spiculae* biseriatae, breviter pedicellatae pedicellis persistentibus, ovatae, acutae, 2 mm. longae, glabrae. *Gluma* inferior nulla; superior 3-nervis, spicula paulo minor. *Anthoecium* inferum ad valvam 7-nervem spiculam aequantem reductum. *Anthoecium* superum ♂, ovatum, acutum, nitidum, brunnescens.—*Paspalum minutiflorum* Benth. Fl. Austral. vii. 461 (1878), non Steud.

QUEENSLAND: Port Curtis, *McGillivray*.

11. **D. didactyla** *Willd.* Enum. Hort. Berol. 91 (1809); Stapf in Kew Bull. 1911, 256; *Panicum gracile* Nees in Spreng. Syst. Veg. iv, ii. 33 (1827) non R. Br.; *P. subtile* Nees in Flora 1828, 300 (nomen); *P. didactylum* Kunth Rév. Gram. 33 (1839); *P. bicorne* Sieb. ex Steud. Syn. Pl. Gram. 41 (1854) non Kunth.

N. S. WALES: Port Jackson, *Sieber Agrostoth.* 72; Sydney, *Maiden*.

12. **D. tenuissima** (*Benth.*) *Hughes* nov. comb.; *Panicum tenuissimum* Benth. Fl. Austral. vii. 470 (1878).

QUEENSLAND: Rockhampton, *O'Shanesy*; Brisbane River, *Mueller*.

13. **D. diminuta** *Hughes* nov. sp.

Perennis, caespitosa usque ad 35 cm. alta inflorescentia inclusa. *Culmi* erecti, 2-nodi nodis pubescentibus vel glabrescentibus. *Foliorum* vaginae subapertae, innovationum hirsutae, caeterum glabrescentes; ligulae membranaceae, integrae, usque ad 2 mm. longae; laminae lineares, planae vel laxe convolutae, 4–12 cm. longae, 0·2 cm. latae, glabrae, utrinque leviter scaberulae. *Racemi* 5, alterni, 4–8 cm. longi. *Spiculae* 2-nae, ovatae, 1·7 mm. longae, glabrae. *Glumae* reductae, rotundato-ovatae; inferior minutissima; superior sub 2-nervis, 0·6 mm. longa. *Anthoecium* inferum ad valvam 7-nervem spiculam aequantem reductum. *Anthoecium* superum ♂, ovatum, 1·7 mm. longum, tenuissime pruinosum, brunnescens.

N. S. WALES: McIntyre River, *Ker* !.

14. **D. orbata** *Hughes* nov. sp.

Perennis, usque ad 45 cm. alta inflorescentia inclusa. *Culmi* erecti, graciles, 2-nodi nodis exsertis glabris. *Foliorum* vaginae subapertae, innovationum dense sericeo-hirsutae, caeterum glabrescentes; ligulae membranaceae, usque ad 1·5 mm. longae; laminae lineares, planae, 6–11 cm. longae, 0·2–0·3 cm. latae, glabrae. *Racemi* subdigitati, 3–7, undulati, usque ad 8 cm. longi. *Spiculae* 2-nae, ovatae, 1·5 mm. longae, glabrae. *Glumae* valde redactae; inferior nulla, superior minutissima, enervis. *Anthoecium* inferum ad valvam 3-nervem spiculam aequantem reductum. *Anthoecium* superum ♂, ovatum, apiculatum, 1·5 mm. longum, tenuissime pruinosum.

QUEENSLAND : Herbert's Creek, *Bowman* !.

15. **D. gibbosa** (*R. Br.*) *Beauv.* Agrost. 160 (1812); *D. orthostachya* Stapf & Jesson in Kew Bull. 1915, 93; *Panicum gibbosum* R. Br. Prod. 193 (1810); Benth. Fl. Austral. vii, 471. *P. orthostachyum* Ewart & Davies, Fl. N. Terr. 38 (1917).

N. TERRITORY : Victoria River, *Mueller*; near Darwin, *Allen* 29, 143; Port Essington, *Armstrong* 589.

QUEENSLAND : Port Curtis, *McGillivray*; Rockhampton, *O'Shanesy*; Keppel Bay, *Brown* 6124 !; and without precise locality, *Mueller*.

16. **D. Brownei** (*R. & S.*) *Hughes* nov. comb.; *Panicum villosum* R. Br. Prod. 192 (1810) non Lam.; *P. Brownei* Roem. & Schult. Syst. ii. 462 (1817); *P. glareae* F. Muell. in Linnaea xxv, 445 (1852); *P. laniflorum* Nees in Hook. Lond. Journ. ii. 410 (1843); *P. leucophaeum* Benth. Fl. Austral. vii. 472 (1878), non H. B. & K.

W. AUSTRALIA : Hunter's River, *Wilkes*.

QUEENSLAND : Rockingham Bay, *Dallachy*; Port Curtis, *McGillivray*; Shoalwater and Keppel Bays, *Brown* 6119 !.

N. S. WALES : Darling River, *Dallachy*; McIntyre River, *Ker*; Endeavour River, *Banks* and *Solander*; Lachlan River, *Fraser* 19, 20; New England, *Stuart*; Clarence River, *Beckler*; Port Jackson, *Brown* 6119 !; Mount Goningberi, *Victorian Expedition*; and without precise locality, *Cunningham, Caley, Mitchell* 68.

var. **monostachya** *Hughes* nov. comb.; *Panicum leucophaeum*, var. *monostachyum*, Benth. Fl. Austral. vii. 472 (1878).

Raceme 1.

W. AUSTRALIA : *Drummond*.

N. S. WALES (?) : Goyinga Mts., *Victorian Expedition*.

17. **D. ammophila** (*F. Muell.*) *Hughes* nov. comb.; *Panicum ammophilum* F. Muell. in Trans. Vict. Inst. 1855, 46; *P. divaricatissimum* var. *ammophilum* Benth. Fl. Austral. vii. 468 (1878).

W. AUSTRALIA : Transcontinental Railway Line, East of Coolgardie, *Stoward* 140.

N. S. WALES : near Menindee, *Victorian Expedition*; Mt. Goningberi, *Victorian Expedition*; Murray and Murrimbidgee Rivers, *Mueller* !.

18. **D. tonsa** *Hughes* nov. nom.; *Panicum radiatum* R. Br. Prod. 192 (1810); *P. divaricatissimum* var. *radiatum* Benth. Fl. Austral. vii. 468 (1878).

N. S. WALES : Port Jackson, *Brown* !.

19. **D. coenicola** (*F. Muell.*) *Hughes* nov. comb.; *Panicum coenicolum* F. Muell. in Trans. Vict. Inst. 1855, 45; Benth. Fl. Austral. vii. 467 (1878); *Leptoloma coenicola* Chase in Proc. Biol. Soc. Wash. xix. 192 (1906).

W. AUSTRALIA : Fraser's Range, *Dempster*; and without precise locality, *Drummond*.

N. Territory: Lake Amadeus, *Giles*.

S. Australia: Cudnaka, *Mueller*!; Muda, *Mitchell*; near Lake Eyre, *Andrews*; and without precise locality, *Stuart*.

N. S. Wales: Murrimbidgee River, *Mueller*.

20. **D. divaricatissima** (*R. Br.*) *Hughes* nov. comb.; *Panicum divaricatissimum* R. Br. Prod. 192 (1810); *P. divaricatissimum* var. *glaberrimum* Benth. Fl. Austral. vii. 468 (1878); *P. divaricatissimum* var. *normale* Benth. l. c.; *Leptoloma divaricatissima* Chase in Proc. Biol. Soc. Wash. xix. 192 (1906).

Queensland: Peak Downs, *Burkitt*.

N. S. Wales: Boggy Plains of the Lachlan River, *Mueller*; Keppel Bay and Port Jackson, *Brown* 6118!.

21. **D. macractenia** (*Benth.*) *Hughes* nov. comb.; *Panicum macractenium* Benth. Fl. Austral. vii. 468 (1878); *Leptoloma macractenia* Chase in Proc. Biol. Soc. Wash. xix. 192 (1906).

Queensland: Herbert's Creek, *Bowman*!.

N. S. Wales: Endeavour River, *Banks* and *Solander*.

III. **Leptoloma** *Chase* in Proc. Biol. Soc. Wash. xix. 192 (1906).

L. papposa (*R. Br.*) *Hughes* nov. comb.; *Panicum papposum* R. Br. Prod. 192 (1810); Benth. Fl. Austral. vii. 468.

N. Territory: Arnhem South Bay, *Brown* 6120!.

IV. **Brachiaria** *Griseb.* in Ledeb. Fl. Ross. iv. 469 (1853).

Spikelets with a silky, transverse, apical fringe:
- Lower valve aristulate; upper valve rugose and mucronate - - - - - - 1. *holosericea*.
- Valves neither aristulate nor mucronate - 2. *argentea*.

Spikelets glabrous, or shortly pubescent, but with no distinct fringe:
- Rachis more or less triquetrous or filiform; lower valvule developed:
  - Spikelets 3·5–4 mm. long; upper glume and lower valve usually 5-nerved:
    - Lower glume $\frac{2}{3}$ or more the length of the spikelet; lower valvule as long as its valve; spikelets pubescent - - - 3. *ramosa*.
    - Lower glume $\frac{1}{2}$ or less the length of the spikelet; lower valvule about $\frac{1}{3}$ as long as its valve; spikelets glabrous - - 4. *polyphylla*.
  - Spikelets 5–6 mm. long; upper glume and lower valve usually 9-nerved - - - 5. *foliosa*.
- Rachis more or less flat and ribbon like, 0·5–1 mm. wide; lower valvule obsolete:
  - Spikelets 5 mm. long, pubescent or with a small tuft of hairs at the apex - - 6. *piligera*.
  - Spikelets 4 mm. long, glabrous - - - 7. *distachya*.

1. **B. holosericea** (*R.Br.*) *Hughes* nov. comb.; *Panicum holosericeum* R. Br. Prod. 190 (1810); Benth. Fl. Austral. vii. 473.

N. Territory: Port Darwin, *Schultz* 14, 113, 830; near Darwin, Pine Creek, *Allen* 111; Arnhem's Land, *McKinlay*; Gulf of Carpentaria, *Brown* 6094!; Victoria River, *Mueller*; near King's Sound, *Poulton*.

Queensland: Thursday Island, *Podenzana*.

2. **B. argentea** (*R.Br.*) *Hughes* nov. comb.; *Panicum argenteum* R. Br. Prod. 190 (1810); Benth. Fl. Austral. vii. 473.

N. Territory: Gulf of Carpentaria, *Brown* 6095!.

3. **B. ramosa** *Stapf* var. **grandiflora** *Hughes* nov. nom.; *Panicum pubescens* R. Br. Prod. 190 (1810); *P. helopus* var. *glabrior* Benth. Fl. Austral. vii. 476 (1878).

N. Territory: Gulf of Carpentaria, *Brown* 6111!; Lower Victoria River, *Mueller*.

4. **B. polyphylla** (*R.Br.*) *Hughes* nov. comb.; *Panicum polyphyllum* R. Br. Prod. 190 (1810); Benth. Fl. Austral. vii. 477.

N. Territory: Port Darwin, *Schultz* 34, 818; near Darwin, *Allen* 31; Port Essington, *Armstrong* 591; Gulf of Carpentaria, *Brown* 6093!.

5. **B. foliosa** (*R.Br.*) *Hughes* nov. comb.; *Panicum foliosum* R. Br. Prod. 191 (1810); Benth. Fl. Austral. vii. 481.

Queensland: Rockhampton, *Thozet*; Keppel Bay, *Brown* 6110!; Moreton Bay, *Stuart*; Brisbane River, *Mueller*.

N. S. Wales: McIntyre River, *Ker*; Brisbane and Endeavour Rivers, *Banks* and *Solander*; Hunter's River, *Caley*.

6. **B. piligera** (*F. Muell.*) *Hughes* nov. comb.; *Panicum piligerum* F. Muell. ex Benth. Fl. Austral. vii. 477 (1878).

N. Territory: Victoria River, *Mueller*!.

var. **intercedens** *Hughes* nov. comb.; *Panicum intercedens* Domin in Journ. Linn. Soc. 1912, 271.

Leaves more or less glabrous and, in the Ashburton River specimens, shorter; otherwise it does not differ from the type. The spikelets are identical.

W. Australia: Between the Ashburton and De Gray Rivers, *Clement*!; in the bed of the Ashburton River, Minderoo, *Morrison*.

N. S. Wales: Warialda, *Hadley*.

7. **B. distachya** (*Linn.*) *A. Camus* Fl. Indo-Chine, vii. 437 (1922); *Panicum distachyum* Linn. Mant. i. 138 (1767); *Digitaria distachya* Pers. i. 85 (1805).

W. Australia: Wallal Country about 100 miles E. of Condon, *Taylor* 232; and without precise localities, *Mueller*, *Stoward*.

S. Australia: Vicinity of Lake Eyre, *Andrews* 31; and without precise locality, *Gosse's Expedition* 169; Great Plains, *Mitchell*.

Queensland: Rockhampton, *O'Shanesy*.

V. Paspalidium *Stapf* in Prain Fl. Trop. Afr. ix. 582 (1920).

Spikelets with stiff tubercle-based hairs along the nerves of the lower and upper glumes; lower floret deeply grooved on the back (see also *P. inaequale*) - - - - - - - 1. *semitonsum*.
Spikelets with no such hairs; lower floret not grooved on the back (except in *P. inaequale*):
Nerves of the upper glume 13–15, anastomosing for at least some distance below the tip; fertile floret much curved in profile:
Glumes strongly inrolled at the tip; lower valve grooved on the back and much exceeding the upper glume in length - - - - - - - 2. *inaequale*.
Glumes not inrolled at the tip; lower valve convex on the back and as long as or slightly longer than the upper glume:
Spikelets ovate in profile; nerves anastomosing to the base of the upper glume and of the lower valve - - - 3. *retiglume*.
Spikelets gibbous; nerves anastomosing for a short distance only below the tips of the upper glume and lower valve - - - - - - - - 4. *globoideum*.
Nerves of the upper glume 5–9, if anastomosing, then only at the very tip; fertile floret not distinctly curved in profile (but see *P. distans*):
Racemes of several spikelets:
Spikelets approximate and very evenly arranged in two close rows in racemes which are seldom branched:
Racemes many flowered, usually 2–4 cm. long, equalling or exceeding the internodes of the long stout main axis; culms rather stout - 5. *jubiflorum*.
Racemes scanty and few flowered, about 1 cm. long, much exceeded by the internodes of the very slender axis; culms weak - - - - 6. *distans*.
Spikelets irregularly arranged in loose racemes which are often branched at the base:
Spikelets loosely disposed in long racemes, not clustered; lower glume

⅔ the length of the spikelet; upper glume as long as the spikelet -	7. *basicladum*.
Spikelets somewhat clustered, at least at the base of the very short racemes; lower glume ½ the length of the spikelet; upper glume slightly shorter than the spikelet - -	8. *gracile*.
Racemes reduced to 1 or, in the lowest, to 2 spikelets, each supported by a bristle	9. *rarum*.

1. **P. semitonsum** (*F. Muell.*) *Hughes* nov. comb.; *Panicum semitonsum* F. Muell. ex Benth. Fl. Austral. vii. 483 (1878).

N. Territory: Victoria River, *Elsey*!.

2. **P. inaequale** (*F. Muell.*) *Hughes* nov. comb.; *Panicum inaequale* F. Muell. Fragm. viii. 189 (1874); Benth. Fl. Austral. vii. 482.

Queensland: Dawson River, *Mueller*!; Herbert's Creek, *Bowman*.

3. **P. retiglume** (*Domin*) *Hughes* nov. comb.; *Panicum retiglume* Domin in Fedde, Repert. Nov. Sp. x. 119 (1911).

N. Territory: Upper Victoria River, *Mueller*!.

4. **P. globoideum** (*Domin*) *Hughes* nov. comb.; *Panicum globoideum* Domin in Fedde, Repert. Nov. Sp. x. 119 (1911).

Queensland: Peak Downs, *Mueller*; Emerald, *Soutter*; Springsure, *Wuth*!; Herbert's Creek, *Bowman*; Clifton, Darby Downs, *White*.

5. **P. jubiflorum** (*Trin.*) *Hughes* nov. comb.; *Panicum jubiflorum* Trin. Gram. Pan. Diss. ii. 150 (1826); *P. flavidum* Benth. Fl. Austral. vii. 474 (1878), p.p. non Retz; *P. flavidum* var. *tenuior* Benth. l.c. p.p.; *P. gracile* Benth. l.c. p.p. non R. Br.

W. Australia: Swan River, *Drummond* 399.

Queensland: Tarampa, *Bailey*; and without precise locality, *Brown* 6097.

N. S. Wales: Warwick, *Beckler*; Ravensworth near Singleton, *Gelling*; Murray River, *Mueller*; lower Darling River, *Mrs. Ford*; Zara via Hay, "*E. Officer*"; and without precise localities, *Mitchell*, *McDougal Stuart* 189, *Giles*.

6. **P. distans** (*Trin.*) *Hughes* nov. comb.; *Panicum distans* Trin. Spec. Gram. t. 172 (1829); *P. gracile* Benth. Fl. Austral. vii. 475 (1878) p.p. non R. Br.; *P. flavidum* var. *jubiflorum* Domin in Biblioth. Bot. lxxxv. 300 (1915).

N. Territory: Port Essington, *Armstrong* 592.

Queensland: Dunk Island, *McGillivray*; Rockingham Bay, *Dallachy*; Herbert's Creek, *Bowman*; and without precise locality, *Leichhardt*; Brisbane Botanic Gardens, *White*.

N. S. Wales : Port Jackson, *Brown* 6098; Endeavour River, *Banks* and *Solander*.

7. **P. basicladum** *Hughes* nov. sp.

Annua, usque ad 45 cm. alta inflorescentia inclusa. *Culmi* geniculato-ascendentes, multinodi nodis glabris, iterum ramosi. *Foliorum* vaginae solutae, glabrae; ligulae breves, ciliatae; laminae lineares, 3–10 cm. longae, 0·1–0·3 cm. latae, planae vel laxe convolutae, apice attenuatae, pungentes. *Racemi* graciles, 2–4 cm. longi, plerumque ramosi. *Spiculae* uniseriatae, 2·2 –3 mm. longae, glabrae. *Glumae* inaequales; inferior 3-nervis, ovato-acuta vel acuminata, 2 mm. longa; superior 5–7-nervis, spiculam aequans. *Anthoecium* inferum ad valvam 5–7-nervem spiculam aequantem reductum. *Anthoecium* superum ♂, 3 mm. longum, rugulosum.

W. Australia : Kiminoppin, *Stoward* 200 !; Transcontinental Railway, East of Coolgardie, *Stoward* 139; and without precise locality, *Drummond*.

8. **P. gracile** (*R. Br.*) *Hughes* nov. comb.; *Panicum gracile* R. Br. Prod. 190 (1810); Benth. Fl. Austral. vii. 475.

W. Australia : Dampier's Archipelago, *Walcot*; Hunter's River, *Wilkes*; Swan River, *Drummond* 101.

Queensland : Keppel Bay, *Brown* 6096 !; and without precise locality, *Bailey*.

var. **rugosum** *Hughes* nov. var.; *P. flavidum* var. *tenuior* Benth. Fl. Austral. vii. 474 (1878) p.p.

Differing from the type in the fruiting valve which is coarsely rugose not finely rugulose.

S. Australia : Vicinity of Lake Eyre, *Andrews* 3; Arkaringa Creek, *Elder Exploring Expedition*; Port Augusta, *Lea*; and without precise locality, *Gosse* 186.

N. S. Wales : Mount Hope, *Mitchell*; New England, *Stuart*; Lachlan River, *Fraser*; and without precise locality, *Cunningham*.

9. **P. rarum** (*R. Br.*) *Hughes* nov. comb.; *Panicum rarum* R. Br. Prod. 189 (1810); Benth. Fl. Austral. vii. 473.

N. Territory : Gulf of Carpentaria, *Brown* 6100 !.

S. Australia : without precise locality, *Gosse* 56.

VI. **Urochloa** *Beauv.* Agrost. 52, t. xi, f. i. (1812).

Spikelets 0·2 cm. long - - - - 1. *reptans*.
Spikelets 0·35–0·5 cm. long :
  Fertile floret coarsely rugose; mucro about 0·1 cm. long; lower glume short, hyaline, nerveless :
    Spikelets glabrous - - - 2. *notochthona*.
    Spikelets pubescent and laterally ciliate - 3. *Gilesii*.

Fertile valve finely rugulose and smooth; mucro very minute; lower glume 0·15–0·2 cm. long, 3–nerved - - - - - 4. *praetervisa.*

1. **U. reptans** (*Linn.*) *Stapf* in Prain Fl. Trop. Afr. ix. 601 (1920); *Panicum reptans* Linn. Syst. Nat. ed. x. 870 (1759); *P. repens* Burm. f. Fl. Ind. 2. f. 1 (1768) non Linn.; *P. prostratum* Lam. Ill. i. 171 (1791); Benth. Fl. Austral. vii. 476 (1878); *P. barbatum* Linn. l.c.; *P. caespitosum* Sw. Fl. Ind. Occ. i. 146 (1797); *P. Sieberi* Link, Hort. Berol. i. 207 (1827); *P. procumbens* var., Nees Agrost. Bras. 109 (1829); *P. crispum* Llanos, Fragm. 42 (1851); *P. insularum* Steud. Syn. Pl. Glum. i. 61 (1854); *P. calaccanzense* Steud. l. c. 65; *P. aurelianum* Hale in Wood, Class-book, ed. iii, 787 (1861); *P. viaticum* Salzm. ex Doell. in Mart. Fl. Bras. ii, ii, 155 (1877); *P. marginatum* Vahl. ex Hook. f. Fl. Brit. Ind. vii. 33 (1897); *Brachiaria prostrata* Griseb. in Abh. Ges. Wiss. Goett. vii. 263.

N. Territory: Upper Victoria River, *Mueller*; Victoria River, Sandy Island, *Mueller.*

2. **U. notochthona** (*Domin*) *Hughes* nov. comb.; *Panicum notochthonum* Domin in Fedde, Repert. x. 60 (1911); *P. helopus* Benth. Fl. Austral. vii. 476 (1878) non Trin.

N. S. Wales: Darling River, *Dallachy*; Tongo Station, Wilcannia, *Hourigan.*

3. **U. Gilesii** (*Benth.*) *Hughes* nov. comb.; *Panicum Gilesii* Benth. Fl. Austral. vii. 477 (1878).

N. Territory: Charlotte Waters, *Giles*!.

S. Australia: Finde River, *Mueller*; and without precise locality, *Gosse* 187.

N. S. Wales: Coonamble, *French.*

4. **U. praetervisa** (*Domin*) *Hughes* nov. comb.; *Panicum praetervisum* Domin in Biblioth. Bot. lxxxv. 309 (1915); *P. adspersum* Benth. Fl. Austral. vii. 481 (1878) non Trin.

S. Australia: Vicinity of Lake Eyre, *Andrews* 156; Mt. Lyndhurst, *Max Koch* 60.

VII. **Echinochloa** *Beauv.* Agrost. 53, t. ii., f.2. (1812).

Spikelets awnless or mucronate only, densely crowded in four rows along the rhachis, without hairs or bristles - - - - - 1. *colona.*
Spikelets mostly acuminate or awned, crowded and clustered along the rhachis, usually intermixed with rigid hairs or bristles - - - 2. *Crus-Galli.*

1. **E. colona** (*Linn.*) *Link* Hort. Berol. ii. 209 (1833); *Panicum colonum* Linn. Syst. Veg. ed. x. 870; Benth. Fl. Austral. vii. 478.

N. Territory: near Darwin, *Allen* 23.

2. **E. Crus-Galli** (*Linn.*) *Beauv.* Agrost. 161 (1812); *Panicum Crus-Galli* Linn. Sp. Pl. ed. i. 56 (1753); Benth. Fl. Austral. vii. 479; *Milium Crus-Galli* Moench. Method. 202 (1794); *Oplismenus Crus-Galli* Kunth, Enum. i. 143 (1833); *Orthopoyon Crus-Galli* Spreng. Syst. i. 307 (1825).

W. Australia: Albany, *Andrews* 1st coll.

N. Territory: Victoria River, *Elsey*; Upper Victoria River, *Mueller*; Shoalwater Bay, *Brown* 6103; Daintree River, *Mueller*.

Queensland: Port Molle, dried up fresh water swamps, *McGillivray*. Parramatta, *Woolls*.

N. S. Wales: McIntyre River, *Ker*; Port Jackson, *Brown*; Sydney, *Moore* 161; *Stephenson* 257, 258; and without precise locality, *Mitchell*.

var. (?) **lacunarium** *Hughes* nov. comb.; *Panicum lacunarium* F. Muell. in Trans. Vict. Inst. 1855, 47; *Panicum Crus-Galli* var. *lacunarium* F. Muell. Fragm. viii. 198 (1874).

N. S. Wales: Murray River, *Mueller*.

VIII. **Paractaenum** *Beauv.* Agrost. 47, t.x, f. 6 (1812); Hughes in Kew Bull. 1923, p. 287.

P. novae-hollandiae *Beauv.* l.c.; *Panicum paractaenum* Kunth Enum. i. 134 (1833); *P. reversum* F. Muell. Fragm. viii. 152 (1874); Benth. Fl. Austral. vii. 478.

W. Australia: Murchison River, *Oldfield*; Shark's Bay (?), Îles Stériles, *Leschenault*; and without precise locality, *Drummond*.

N. Territory: Lake Amadeus, *Giles*.

S. Australia: Vicinity of Lake Eyre, *Andrews* 44.

IX. **Panicum**, *Linn.* Sp. Pl. 55 (1753).

*Spikelets glabrous or only softly pubescent:

†Spikelets gaping early and permanently, more or less laterally compressed, the glumes and lower valve acuminate, often constricted and rather firmer towards the tip:

Lower glume half as long or as long as the spikelet:

Panicle large, decompound; lower glume shortly aristulate, almost as long to slightly longer than the spikelet:

Spikelets 3·5–4 mm. long; divisions of the panicle coarse and rigid - - - - - - 1. *trachyrhachis*.

Spikelets 2·5–3 mm. long; divisions of the panicle very fine and softly flexuose - - - - 2. *delicatum*.

Panicle very scanty and sparingly branched; lower glume half as long as the spikelet - - - - 3. *fulgidum.*

Lower glume less than half as long as the spikelet:

Spikelets 3–4 mm. long:

Panicles up to 40 cm. long; spikelets subsessile, set obliquely and crowded on the short secondary branchlets of the panicle - 4. *cymbiforme.*

Panicles up to about 20 cm. long; spikelets not arranged as in *P. cymbiforme*:

Spikelets slender; pedicels like the panicle branches, long and extremely fine - - - 5. *capillipes.*

Spikelets plump; pedicels and panicle branches short and somewhat stout, crowded - 6. *airoides.*

Spikelets 2 mm. long - - - 7. *sarmentosum.*

†† Spikelets not gaping and compressed, or if at all dorsally:

Lower glume $\frac{2}{3}$–$\frac{3}{4}$ the length of the spikelet, prominently 5–7-nerved:

Panicle branches fine, flexuose, few-flowered; pedicels capillary, up to 1·5 cm. long, (*e descr.*) - - - 8. *simile.*

Panicle branches rather rigid; pedicels short and comparatively stout:

Compactly caespitose, 1–2-noded; spikelets 4·2–4·5 mm. long; lower glume acutely acuminate - - 9. *queenslandicum.*

Stoloniferous, stems many-noded, wiry; spikelets 3–3·5 mm. long; lower glume contracted in the middle, obtuse - - - - 10. *prolutum.*

Lower glume scarcely over half the length of the spikelet, usually short, truncate or subacute with the lateral nerves not prominent, often rudimentary or wanting:

‡ Culms few to many-noded, tufted, erect, never prostrate or creeping:

Panicle large, stiffly spreading, hardly exceeding the broad uppermost leaf; stems stout, semi-aquatic, compressible:

Lateral branchlets remaining approximate to the branches,

like the pedicels, stout, triquetrous and more or less grooved between the angles; lower valve ♂ - - - - - - 11. *paludosum.*

Lateral branchlets spreading, slender, triquetrous but not grooved between the angles; lower valve θ - - - - - 12. *decompositum.*

Panicle contracted, or if spreading, then with branches not rigid and straight, exserted:

Culms wiry, many-noded; leaves not over 0·3 cm. wide:

Spikelets 3·5–4 mm. long; panicle contracted, flexuose - 13. *Buncei.*

Spikelets 2·5 mm. long; panicle spreading, not flexuose - - - - - 14. *larcomianum.*

Culms not wiry, or if so, then not more than 3-noded; leaves 0·3–1 cm. wide:

Spikelets 2·5–3 mm. long, panicle many - flowered, with the spikelets evenly distributed throughout; nodes glabrous; leaves 15–30 cm. long - - - 15. *Mitchelli.*

Spikelets about 2 mm. long, panicles few-flowered, with the spikelets in pairs at the ends of the long lateral branchlets; nodes bearded; leaves usually about 8–15 cm. long - - - - - 16. *effusum.*

‡‡ Culms many-noded, branching at the nodes, prostrate or creeping, annual:

Spikelets 2–3 mm. long:

Plants glabrous; stems very soft, compressible:

Panicle many-flowered, large, decompound effuse - 17. *acroanthum.*

Panicle few-flowered, about 4 cm. long, sparingly branched 18. *obseptum.*

Plant clothed with short tubercle-based hairs; stems hard, rather wiry; panicle scanty, 3–4 cm. long - - 19. *lachnophyllum.*

Spikelets 1·5–2 mm. long :	
Panicle scanty, sparingly branched, up to 5 cm. long with rigid branches; spikelets glabrous, shortly pedicelled; leaves ovate-lanceolate, 1–3 cm. long - - - - - -	20 *pygmaeum*.
Panicle much branched with fine capillary branches up to about 15 cm. long; spikelets pubescent on long delicate pedicels; leaves ovate or tapering at the tip, 1·5–6 cm. long - - - - - - -	21. *trichoides*.
**Glumes and lower valve sprinkled with short hooked hairs; panicle rigid, scanty and few-flowered; culms very wiry, much branched; leaf-blades more or less reduced	22. *uncinulatum*.

1. **P. trachyrhachis** *Benth.* Fl. Austral. vii. 490 (1878).

N. Territory : Victoria River, *Elsey*; Port Darwin, *Schultz*!; Arnhem's Land, *McKinlay*.

2. **P. delicatum** *Hughes* nov. sp.

Annua ad 70 cm. alta panicula inclusa. *Culmi* erecti vel geniculato-ascendentes, teretes, usque ad 5-nodi nodis exsertis glabris. *Foliorum* vaginae subapertae, pilis paucis basi tuberculatis indutae; ligulae breves, dense ciliatae; laminae planae, usque ad 24 cm. longae, 0·6 cm. latae, utrinque pubescentes. *Panicula* laxa, decomposita, vix exserta, usque ad 35 cm. longa; rami ramulique capillares, scaberuli, ad extremitates spiculas brevipedicellatas gerentes, caeterum nudum. *Spiculae* hiantes, 2·5 mm. longae, glabrae. *Glumae* inaequales; inferior 3-sub-5-nervis, dorso scaberula, 2 mm. longa; superior 5-nervis, spiculam aequans. *Anthoecium* inferum ad valvam 5-nervem spiculam aequantem reductum. *Anthoecium* superum ♂, ovale, laevissimum, nitidum, 1·5 mm. longum.

N. Territory : near Port Darwin, *Allen* 176, 178!.

3. **P. fulgidum** *Hughes* nov. nom.; *P. bicolor* R. Br. Prod. 191 (1810); Benth. Fl. Austral. vii. 487, non Moench.

N. Territory : Port Darwin, *Schultz*.

Queensland : Brisbane River, *Mueller*, *Bailey*.

N. S. Wales : New England, Clifton, *Stuart*; Parramatta, *Woolls*; Port Jackson, *Brown* 6107!; Botany Bay, *Banks* and *Solander*; Maneroo, *Mrs. Calvert*.

4. **P. cymbiforme** *Hughes* nov. sp.

Basis incognita. *Culmus* florifer procerus, robustus, sparse et brevissime pubescens, nodis densius pubescentibus. *Foliorum*

vaginae laxiusculae, uti laminae inter nervos prominentes sparse pubescentes vel glabrescentes; ligulae breves, dense ciliatae; laminae planae vel laxe convolutae, usque ad 30 cm. longae, basi circiter 0·6 cm. latae, apice longe attenuatae. *Panicula* usque ad 40 cm. longa, non multo divisa; axis primarius robustus, internodiis paucis usque ad 12 cm. longi; ramuli perbreves 0·5-1 cm. longi, glomeruliformes. *Spiculae* subsessiles, obliquae, 3·5 mm. longae. *Glumae* valde inaequales; inferior cymbiformis, 3-sub-5-nervis, 1 mm. longa; superior spiculam aequans, prominenter 7-nervis. *Anthoecium* inferum ♂; valva spiculam aequans, medio profunde canaliculata, 5- sub-7-nervis; valvula ad margines anguste alata; antherae 1·5 mm. longae. *Anthoecium* superum ♂, laevissimum, nitidum, 2·2 mm. longum. —*P. antidotale* Benth. Fl. Austral. vii. 483 (1878) p.p. non Retz.

W. Australia: Cygnet Bay, *Cunningham* 341!.

5. **P. capillipes** *Benth.* Fl. Austral. vii. 484 (1878).

W. Australia: Escape Cliffs, *Hulse.*

N. Territory: Port Darwin, *Schultz* 806!.

6. **P. airoides** *R. Br.* Prod. 190 (1810); *P. repens* Benth. Fl. Austral. vii. 484 (1878).

Queensland: Gulf of Carpentaria; *Brown* 6112!, *Henne.*

N. S. Wales: Endeavour River, *Banks* and *Solander*; Murray River, *Mueller.*

7. **P. sarmentosum** *Roxb.* var. **Prenticeanum** *Domin* in Biblioth. Bot. lxxxv. 315 (1915); *P. Prenticeanum* Bail. Syn. Queensl. Fl. Suppl. iii. 82 (1890).

Queensland: Rockingham Bay, *Dallachy*; Russell River, Harvey's Creek, *Bailey*!.

8. **P. simile** *Domin* in Biblioth. Bot. lxxxv. 322 (1915) e descr.; *P. Mitchelli* Benth. Fl. Austral. vii. 489 (1878) p.p.

Queensland: Cape York, *Damel.*

9. **P. queenslandicum** *Domin* in Fedde, Repert. x. 59 (1911); *P. prolutum* Benth. Fl. Austral. vii. 491 non F. Muell.; *P. Benthami* Domin l.c.; *P. Shirleyanum* Domin in Biblioth. Bot. lxxxv. 321.

Queensland: Condamine River, *Hartmann*; Peak Downs, *Mueller*; Springsure, *Wuth.*

W. Australia: Hunter's River, *Wilkes.*

There seems to be no distinct difference by which to separate specifically *P Shirleyanum* from *P. queenslandicum.* The spikelets are identical. The specimen from the Condamine River, which is the type of *P. queenslandicum*, is about 15 ins. high with narrow convolute leaves. Of the two specimens from Springsure and Peak Downs which are enumerated under the description of *P. Shirleyanum* (*P. Benthami* Domin non Steud.) the former

is a short plant, about 10 ins. high with narrow, flat or loosely convolute leaves, while the latter, which is without a base, is taller and much more luxuriant. The leaves are broad and flat, or with a tendency at the margins to roll inwards. In the Hunter's River specimen they are narrow and loosely convolute.

10. **P. prolutum** *F. Muell.* in Trans. Vict. Inst. 1855, 46; Benth. Fl. Austral. vii. 490.

N. S. Wales: Murray River, *Mueller*; Murrimbidgee River, *Mueller*; Darling River, *Dallachy*; Zara via Hay "*E. Officer*"

Victoria: Avoca River, *Mueller*.

11. **P. paludosum** *Roxb.* Fl. Ind. i. 307 (1820); *P. decompositum* Benth. Fl. Austral. vii. 484 (1878) p.p. non R. Br.; *P. proliferum* F. Muell. Fragm. viii. 191 (1874) non Lam.

N. Territory: Victoria River, *Mueller*.

Queensland: Archer's Lagoon, *Leichhardt*; King's Creek, *Bowman*.

12. **P. decompositum** *R. Br.* Prod. 191 (1810).

Key to the Varieties.

Spikelets 2·5–3 mm. long; leaves usually smooth:	
Culms many-noded, slender, 1–2 mm. in diameter; leaves long, linear, not over 2 mm. wide - - -	var. *tenuius*.
Culm 3–4-noded, stout, 4–6 mm. in diameter; leaves tapering, about 1 cm. wide at the base - -	var. *typicum*.
Spikelets 3·5–4 mm. long; leaves scabrid towards the tip:	
Leaf-sheaths glabrous and smooth, leaves narrow, about 4 mm. wide at the base, acuminate, long tapering to a fine point; lower valvule 3·5 mm. long, margins distinctly fringed - -	var. *acuminatissimum*.
Leaf-sheaths shortly pubescent with tubercle-based hairs; leaves broad at the base (1 cm. wide or wider); lower valvule 2 mm. long, margins very narrow, glabrous, or with a few very short cilia - - - - -	var. *scaberrimum*.

var. **tenuius** *F. M. Bailey*, Queensl. Agric. Journ. xxx. 314 (1913).

Queensland: Gindie, *Bick* 5, 6, 7, 8.

var. **typicum** *Domin* in Journ. Linn. Soc. xli. 269 (1912); var. *utile* Domin l.c.; *P. Whitei* J. M. Black in Trans. Roy. Soc. S. Austral. xli. 632 (1917).

W. Australia : between the Ashburton and the De Gray Rivers, *Clement*; between the Ashburton and Yule Rivers, *Clement*; Murchison District, *Stoward* 161; Murchison River, Oolingarra, *Oldfield*; Swan River, *Drummond* 43.

N. Territory : Victoria River, *Mueller*, p.p.

S. Australia : " camp 15 " (Everard and Musgrave Ranges), *Helms*; Mt. Lyndhurst, *Max Koch* 448; vicinity of Lake Eyre, *Andrews* 129, 155; Strzelecki Creek, *White* 3; and without precise localities, *Gosse* 112, *McDougal Stuart* 25.

Queensland : Carpentaria, *Brown*; Keppel Bay, *Brown* 6104 !; Port Curtis, *McGillivray*; Moreton Bay, *Mueller*.

N. S. Wales : Zara via Hay, " *E. Officer* "; Macaulay River, *Oldfield*.

var. **acuminatissimum** *Domin* l.c.

W. Australia : between the Ashburton and De Gray Rivers, *Clement* !.

N. Territory : Victoria River, *Mueller* p.p.

Queensland : Carpentaria, *Brown* p.p.; Gindie, *Bick*.

N. S. Wales : Macquarie and Castlereagh Rivers, *Woolls*; Hastings River, *Beckler*.

var. **scaberrimum** *Domin* l.c.

W. Australia : Cygnet Bay, *Cunningham* 340; between the Ashburton and De Gray Rivers, *Clement* !; Nicol Bay and De Gray River, *Ridley's Expedition*.

13. **P. Buncei** *F. Muell. ex Benth.* Fl. Austral. vii. 487 (1878).

N. S. Wales : Bokhara Flats, *Leichhardt* !; Pillega Scrub, *Fry*.

14. **P. larcomianum** *Hughes* nov. sp.

Perennis, caespitosa, usque ad 90 cm. alta panicula inclusa, glabra. *Culmi* erecti vel subgeniculato-ascendentes, lignosi, ramosi, multinodi nodis exsertis. *Foliorum* vaginae apertae; ligulae brevissimae, ciliolatae; laminae tenuiter convolutae, circiter 6–13 cm. longae, apice attenuatae, pungentes. *Panicula* decomposita, circiter 20 cm. longa, pauciflora; rami ramulique filiformes, leviter scaberuli. *Spiculae* ovatae, acutae, 2·5 mm. longae. *Glumae* inaequales; inferior acuta, 3–5 nervis, 1·2 mm. longa; superior 7-nervis, spiculam aequans. *Anthoecium* inferum ♂; valva 7–9 nervis, spiculam aequans; valvula reducta, 1·2 mm. longa. *Anthoecium* superum ♂, ovato-oblongum, 1·8 mm. longum, nitidum, brunnescens.

Queensland : Mt. Larcom, *Bick.* !

15. **P. Mitchelli** *Benth.* Fl. Austral. vii. 489 (1878).

Queensland : Endeavour River, *Cunningham* 347 !; Cape Grafton, *Cunningham* 51; Rockingham Bay, *Dallachy*.

16. **P. effusum** *R. Br.* Prod. 191 (1870); *P. convallium* F. Muell. in Trans. Vict. Inst, 1855, 46; *P. effusum* var. *convallium* Benth. Fl. Austral. vii. 488 (1878).

W. Australia: Fraser's Range, *Dempster*.

S. Australia: Torrens River, *Mueller*; and without precise locality, *Gosse* 231.

Queensland: Lizard Island, *McGillivray*; Cape Grafton, *Cunningham* 51; Herbert's Creek, *Bowman*; Rockhampton, *Bowman, Lea*.

N .S. Wales: McIntyre River, *Ker*; Blue Mountains, *Woolls*; Parramatta, *Woolls*; Port Jackson, *Brown*; Manduruga Creek, *Victorian Expedition*; Murray River, *Mueller*; and without precise locality, *Sieber* 67.

17. **P. acroanthum** *Steud.* Syn. Pl. Glum. 87 (1854); *P. melinanthum* F. Muell. in Trans. Vict. Inst. i, 47 (1855); Benth. Fl. Austral. vii. 488; *P. coloratum* F. Muell. Fragm. viii. 192 (1874) non Linn.

Queensland: Brisbane River, *Bailey*.

N. S. Wales: near Tenterfield, *Stuart*: Clarence River, *Wilcox*.

Victoria: King River, *Mueller*; Orient River, *Mueller*.

18. **P. obseptum** *Trin.* Gram. Pan. Diss. ii. 149 (1826); Benth. Fl. Austral. vii. 486.

N. S. Wales: New England, *Stuart*; Parramatta, *Woolls*; Port Jackson, *Woolls!*.

19. **P. lachnophyllum** *Benth.* Fl. Austral. vii. 486 (1878).

Queensland: Moreton Bay, *Stuart!*.

20. **P. pygmaeum** *R. Br.* Prod. 191 (1810); Benth. Fl. Austral. vii. 484.

Queensland: Cleveland Bay, *Gulliver*; Brisbane River, *Mueller*.

N. S. Wales: Blue Mountains, *Miss Atkinson* (*Mrs. Calvert*); Coffs Harbour, *Boorman* 826; Port Jackson, *Brown* 6108!.

21. **P. trichoides** *Sw.* Prod. Veg. Ind. Occ. 24 (1788); Benth. Fl. Austral. vii. 485; *P. minutum*, R. Br. Prod. 191 (1810).

N. Territory: Port Darwin, *Schultz* 264.

Queensland: Daintree River, *Fitzalan*; Endeavour River, *Banks* and *Solander* 17, p.p.

22. **P. uncinulatum** *R. Br.* Prod. 191 (1810); Benth. Fl. Austral. vii. 482.

Queensland: Rockhampton, *O'Shanesy*; Herbert's Creek, *Bowman*; Burnett River, *Mueller*; East Coast, *Brown!*.

In the form of the inflorescence and in the shape and indumentum of the spikelets there is a certain resemblance between

this species and *Pseudechinolaena polystachya* Stapf (*Echinolaena polystachya* H.B. & K.), but in the former the back of the fruit is apparently adaxial and the lower glume is small and not herbaceous. The specimens quoted are scanty and in poor condition, but when better material is available it will show whether this affinity is true or only superficial, or whether the species is perhaps worthy of distinct generic rank. The nearest ally, *Panicum numaeënse* Bal. (in Bull. Soc. Bot. Fr. xix. 325, 1872) from New Caledonia, may prove to be identical with it when more complete specimens of each species have been examined.

X. **Ichnanthus** *Beauv.* Agrost. 56, t. xii, f. 1 (1812).

Leaves ovate-lanceolate, about 1 cm. or more wide; lower floret ♂ - - - - 1. *pallens.*
Leaves linear; lower floret θ; valvule rudimentary or none :
  Spikelets oblong, obtuse, 3 mm. long; panicle much contracted; branches slender - - - - - - - - 2. *oblongus.*
  Spikelets ovate, acute or acuminate, 4–6 mm. long; panicle stiffly spreading :
    Culms hard and woody; leaves and sheaths glabrous or with short scattered tubercle-based hairs :
      Culms fastigiate; plants 7–20 cm. high; panicle exceeded by the uppermost sheaths :
        Spikelets 3·5–4 mm. long; lower glume ovate, acute, about 2 mm. long; upper glume 7-nerved - - 3. *australiensis.*
        Spikelets 5 mm. long; lower glume ovate-acuminate, 3 mm. long; upper glume 9-nerved - - - - 4. *Muelleri.*
      Culms not fastigiate; plants tall; panicle exceeding the uppermost sheath; spikelets 5–6 mm. long - 5. *majusculus.*
    Culms soft, fine, few-noded, not much branched; leaves and sheaths densely white-hirsute all over; spikelets 5 mm. long - - - - - - - - 6. *pauciflorus.*

1. **I. pallens** (*Sw.*) *Munro* in Benth. Fl. Hongk. 414 (1861); *Panicum pallens* Sw. Prod. 23 (1788); *P. vicinum* Bailey Syn. Queensl. Fl. Suppl. iii. 82 (1890).

QUEENSLAND : Harvey's Creek, *Bailey.*

2. **I. oblongus** *Hughes* nov. sp.

Basis incognita. *Culmi* geniculato-ascendentes, multinodi nodis nigris glabris. *Foliorum* vaginae solutae, striatae, pilis

albidis basi tuberculatis sparse hirsutae; ligulae breves, membranaceae, integrae, a dorso longe ciliatae; laminae lanceolatae, 6–8 cm. longae, apice attenuatae, 0–5 cm. latae, basi auriculatae, abrupte constrictae, glabrae. *Panicula* vix exserta, anguste contracta, 12 cm. longa ramis ramulisque tenuibus. *Spiculae* oblongae, obtusae, 3 mm. longae, glabrae. *Glumae* inaequales; inferior 3-nervis, 2 mm. longa; superior 7-nervis, 2·5 mm. longa. *Anthoecium* inferum ad valvam 7-nervem spiculam aequantem reductum. *Anthoecium* superum 3 mm. longum appendice 0·3 mm. longo incluso.—*Panicum trachyrhachis* var. *tenuior* Benth. Fl. Austral. vii. 490 (1878) p.p.

QUEENSLAND: Percy Island, *Cunningham*!.

With some hesitation this species is included in *Ichnanthus*. The basal appendage is not very obvious and may be only analogous to the slightly elongated internode found in *Panicum capillipes* Benth. and also in *P. stipitatum* Nash, from North America. The general habit with geniculate branching culms and flat lanceolate leaves is rather more in accord with the Australian species of *Ichnanthus* than with the Australian species of *Panicum*. The one specimen quoted is scanty and incomplete so that it is impossible to dissect a number of spikelets for examination.

3. **I. australiensis** (*Domin*) *Hughes* nov. comb.; *Panicum australiense* Domin in Journ. Linn. Soc. xli. 271 (1912); *P. pauciflorum* Benth. Fl. Austral. vii. 488 (1878), p.p., non R.Br.

W. AUSTRALIA: between the Ashburton and De Gray rivers, *Clement*!; between the Ashburton and Yule Rivers, *Clement*!.

N. TERRITORY: Lat. 17° 58, *MacDougal Stewart's Expedition*; near Alice Springs, *Giles*; upper Victoria River, *Mueller*.

4. **I. Muelleri** *Hughes* nov. sp.

Annua, usque ad 20 cm. alta. *Culmi* lignosi, geniculato-ascendentes, multinodi nodis pubescentibus, iterum ramosi. *Foliorum* vaginae solutae, striatae, pilis brevibus basi tuberculatis indutae; ligulae breves, dense ciliatae; laminae lineares, laxe convolutae, usque ad 8 cm. longae et ad 0·3 cm. latae applanatae. *Panicula* non exserta, ovata; rami ramulique tenuissimi, patentes. *Spiculae* ovato-oblongae, acuminatae, 5 mm. longae, glabrae. *Glumae* inaequales; inferior ovata, acuminata, 7-nervis, 3 mm. longa; superior 9-nervis, spiculam aequans. *Anthoecium* inferum ad valvam 7-nervem spiculam aequantem reductum. *Anthoecium* superum ♂, 3 mm. longum appendice 1 mm. longo incluso.

W. AUSTRALIA: near King's Sound *Mueller*!.

5. **I. majusculus** (*F. Muell.*) *Hughes* nov. comb.; *Panicum majusculum* F. Muell. ex Benth. Fl. Austral. vii. 482 (1878).

N. TERRITORY: Victoria River, *Elsey*!.

I. pauciflorus (*R. Br.*) *Hughes* nov. comb.; *Panicum pauciflorum* R. Br. Prod. 191 (1810).

N. Territory: Gulf of Carpentaria, *Brown!*.'

XI. **Cyrtococcum** *Stapf* in Prain Fl. Trop. Afr. ix. 745 (1920).

C. oxyphyllum (*Steud.*) *Stapf* ms., nov. comb.; *P. oxyphyllum* Steud. Syn. Pl. Glum. 65 (1854), *P. hermaphroditum* Steud. l.c. 67; *P. pilipes* Nees & Arn. ex Büse in Miq. Pl. Jungh. iii. 376 (1854).

Queensland: Daintree River, *Fitzalan*.

XII. **Sacciolepis** *Nash* in Britton Man. Bot. 89 (1901).

Spikelets 2·5 to 3 mm. long, acuminate, not turgid - - - - - - - - - 1. *indica*.

Spikelets 1-1·2 mm. long, acute or subobtuse, turgid - - - - - - - - - 2. *myosuroides*.

1. **S. indica** (*Linn.*) *Chase* in Proc. Biol. Soc. Wash. i. 8 (1908); *Aira spicata* Linn. Sp. Pl. 63 (1753); *A. indica* L. Sp. Pl. (1753) in Errata; *Panicum indicum* L. Mant. ii. 184 (1774); *P. angustum* Trin. Sp. Gram. t. 334 (1836); *P. arcuatum*, R. Br. Prod. 189 (1810); *P. phleoides* R. Br. l.c.; *Hymenachne indica* Büse in Miq. Pl. Jungh. 377 (1854).

N. Territory: Port Darwin, *Schultz* 145; near Darwin, *Allen* 91; and without precise locality, *Gulliver*.

Queensland: Wide Bay, *Leichhardt*; Moreton Bay, *Mueller*; Etheridge River, *Mueller*.

N. S. Wales: Port Jackson, *Boorman* 613, *Banks* and *Solander*.

2. **S. myosuroides** (*R.Br.*) *Hughes* nov. comb.; *Panicum myosuroides* R.Br. Prod. 189 (1810).

N. Territory: Victoria River, *Mueller*; Port Darwin, *Schultz*.

Queensland: Endeavour River, *Banks* and *Solander*, *Cunningham* 136; Dawson River, *Mueller*.

XIII. **Hymenachne** *Beauv.* Agrost. 48, t. 10, f. 18 (1812).

H. amplexicaulis (*Rudge*) *Nees* Agrost. Bras. 276 (1829); *Panicum amplexicaule* Rudge, Pl. Guian. i. 27 (1805); *P. hymenachne* Desv. Opus. 82 (1831); *P. myuros* of authors not Lam.; *Agrostis monostachya* Poir. Encycl. Suppl. i. 256 (1810).

Queensland: Trinity Bay, *Bailey*.

XIV. **Entolasia** *Stapf* in Prain Fl. Trop. Afr. ix. 739 (1920).

Leaves convolute, rigid and pungent; culms slender, wiry; spikelets 2·5 mm. long- - - 1. *stricta*.

Leaves broad, flat, long tapering to a fine point; culms not wiry; spikelets 3–3·5 mm. long - - - - - - - - - - 2. *marginata*.

1. **E. stricta** (*R.Br.*) *Hughes* nov. comb.; *Panicum strictum* R. Br. Prod. 190 (1810); *P. marginatum* var. *strictum* Benth. Fl. Austral. vii. 486 (1878).

QUEENSLAND: Moreton Bay, *Mueller*.

N. S. WALES: McIntyre River, *Ker*; Sydney, *Stephenson* 119, *Banks* and *Solander*, *Lowne*; Port Jackson, *Mueller*, *Sieber Agrostoth.* 90, *Brown* 6099!, *Moore* 30, 52, 56, *Maiden* 186; Botany Bay, *Boorman* 186a; and without precise locality, *Caley*.

2. **E. marginata** (*R Br.*) *Hughes* nov. comb.; *Panicum marginatum* R. Br. Prod. 190 (1810); *P. marginatum* var. *majus* Benth. Fl. Austral. vii. 486 (1878).

QUEENSLAND: Wide Bay, *Mueller*.

N. S. WALES: New England, *Stuart*; Hastings River, *Moore* 46; Port Jackson, *Brown* 6113!, *Sieber Agrostoth.* 69, 71; Macleay River, *Beckler* 8759; and without precise locality, *Caley*, *Mitchell*, *Stuart*.

VICTORIA: Between the Goulburn and Broken River, *Mueller*; Tambo, *Mueller*.

Imperfectly known Species.

Panicum aequabile *Domin* in Biblioth. Bot. lxxxv. 297 (1915), placed in § *Digitaria*. The description of the panicle is suggestive of *Leptoloma*.

QUEENSLAND: Waterfall Creek, *Domin* I. 1910.

P. breviglume *Domin* l.c. 298, is obviously allied to *Digitaria tenuissima*, *D. diminuta* and *D. orbata*, but seems to be a distinct species.

QUEENSLAND: Dividing Range, *Domin* II. 1910.

P. chillagoense *Domin* l.c. 324, is probably a true *Panicum*.

QUEENSLAND: near Chillagoe, *Domin* II. 1910.

P. Clementii *Domin* in Journ. Linn. Soc. xli. 272 (1912). From the description this is probably near *Paspalidium gracile*.

N. W. AUSTRALIA: Ashburton and Yule Rivers, *Clement*.

P. commixtum *Steud.* Syn. Pl. Gram. 59 (1854). Apparently a *Brachiaria* or *Paspalidium*.

N. S. WALES: Port Jackson, (Collector?).

P. constrictum *Domin* l.c. 302, is probably *Paspalidium gracile*, var. *rugosum*.

QUEENSLAND: near Pentland, *Domin* II. 1910.

P. culicinum *F. Muell.* Fragm. viii. 189, is, according to Bentham in Fl. Austral. vii. 475, a synonym of *P. obtusum* from Mexico.

P. deschampsioides *Domin.* l.c. 320. A true *Panicum*, probably quite distinct.

QUEENSLAND : Castle Hill near Townsville, *Domin* II. 1910.

P. incomptum *F. Muell.* Fragm. x. 76. See note in Benth. Fl. Austral. vii. 489.

P. leucostachyum *Domin* l.c. 299. Evidently closely allied to *Digitaria villosa*.

QUEENSLAND : Russell River, *Domin* I. 1910; Dividing Range, east of Pentland, *Domin* II. 1910; Stradbroke Island in Moreton Bay, *Domin* IV. 1910.

P. nematostachyum Bail. Bot. Bull. Dept. Agric. Queensl. 16.2. (1903). Judging from the description this must be near *Digitaria coenicola*.

P. seminudum *Domin* l.c. 321. This species seems closely allied to and may be the same as *P. gracilipes*, but the panicle is more stiffly spreading and the lower glume seems smaller in proportion to the rest of the spikelet.

N. QUEENSLAND : near Yarraba, *Domin* I. 1910.

P. singulare *Steud.* Syn. Pl. Gram. 60 (1854) is an *Entolasia*, probably *E. marginata*.

P. subjunceum *Domin* l.c. 314. The illustration of this species shows it to be quite distinct.

QUEENSLAND : Dividing Range, east of Pentland, *Domin* II. 1910.

P. subxerophilum *Domin* l.c. 316. Allied to *P. bicolor*, but it has a different habit, entire ligule and obtuse spikelets.

QUEENSLAND : Dividing Range near Jericho, *Domin* III. 1910.

P. tabulatum *Hack.* in Engl. Jahrb. vi. 234 (1885). Probably allied to *Paspalidium gracile*.

W. AUSTRALIA : Dampier's Archipelago, *Naumann*.

P. tubulatum in the Index Kewensis is an obvious error for *P. tabulatum* (see above).

P. tulcumbense *Turner* in Proc. Linn. Soc. N. S. Wales. xxviii. 56 (1898). A true *Panicum* possibly near *P. gracilipes*.

N. S. WALES : Liverpool Plains, *Turner*.

P. Whiteanum *Domin* l.c. 305. This species is compared in the description with *P.* (*Brachiaria*) *piligerum* and *P.* (*Brachiaria*) *polyphyllum*.

XXXIII.—CONTRIBUTIONS TO THE FLORA OF SINALOA: III.*

L. A. M. Riley.

Leguminosae, subfamily Papilionaceae.

Crotalaria eriocarpa *Benth.* Bot. Sulph. 80 (1844), quoad specimen Beecheyanum; Hemsl. Biol. i. 226, partim; Rose in CNH. viii. 47, in obs.; Zoe, v. 201; Standley in CNH. xxiii. 437, excl. syn. *C. viminalis*.—*C. incana* var. *β* Hook. et Arn. Bot. Beech. 285.

Tepic, *Lay and Collie*. Sinaloa: Mazatlan, fl. Dec. 1848, *Seemann* 1526; Cofradia, *Brandegee*.

Vernacular names "Tronador," "Cascabelito."

C. eriocarpa Benth. and *C. viminalis* Rose are different species, as pointed out by Rose, l.c. The type of the former is Lay and Collie's specimen from Tepic, which Hooker and Arnott previously described as *C. incana* var. *β*. Tate's specimen cited by Bentham, l.c., which is unlocalized, is probably *C. viminalis*.

C. eriocarpa differs from *C. viminalis* in the much shorter and more numerous branchlets clothed with a dense tawny subappressed indumentum: shorter racemes, smaller bracts and flowers, and the appressed indumentum of the calyx.

Crotalaria polyphylla *Riley*, sp. nov.; fruticulus foliis numerosis confertis lineari- vel oblongo-lanceolatis sericeis, caulibus inferne propter bases prominentes foliorum delapsorum nodulosis distinctus.

Caules lignosi, rigidi, ramosi, multifoliati, hornotini fulvo-sericei, annotini appresse griseo-pilosi, 1·5 mm. diametro 1 dm. infra apices. *Folia* simplicia, brevissime petiolata, ut videtur exstipulata, superiora lineari- vel oblongo-lanceolata, inferiora oblonga, acuminata, basi subrotundata, discolora, supra exsiccando brunnea, griseo-pilosa, subtus fulvo-sericea, 1·5–3 cm. longa, 3–5 mm. lata, inferiora quam superiora breviora et latiora; petioli vix 1 mm. longi. *Pedunculi* 2–2·5 cm. longi, pauciflori. *Bracteae* lineari-lanceolatae vel subulatae, fulvo-sericeae, 4–5 mm. longae. *Pedicelli* 5–6 mm. longi. *Bracteolae* lineari-acuminatae, parte calyci adnatae circiter 1 mm. longa, parte libera 3 mm. longa. *Calyx* fulvo-sericeus, in toto 11·5 mm. longus, in duo labia sinu 9 mm. alto divisus; labium superius dentibus triangularibus acutis basi 2·5 mm. latis, sinu intermedio 5 mm. alto; labium inferius dentibus acuminato-triangularibus basi 1·5 mm. latis, sinibus intermediis 7 mm. altis. *Corolla* pellucido-punctata; vexillum 1 cm. longum, 9 mm. latum, in basin gradatim angustatum; alae obovato-oblongae, 9 mm. longae ungue incluso, 3·5 mm. latae, venis conspicuis, ungue 1 mm. longo; carinae petala 9·5 mm. longa, 4 mm. lata, 6·5 mm. conjuncta, ungue 1 mm.

* Continued from *K.B.*, 1923, p. 175.

longo. *Antherae* majores 2 mm. longae. *Ovarium* breviter stipitatum, glabrum, 5 mm. longum, circiter 12-ovulatum; stylus 6 mm. longus, parum barbatus. *Legumen* circiter 2 cm. longum, 8 mm. latum.—*C. Purshii* Seem. Bot. Herald, 279; Hemsl. Biol. i. 228. non DC.

Sierra Madre, *Seemann* 2187.

C. rotundifolia var. **brachytricha** *Sprague et Riley*, var. nov.; caulis et foliorum pilis duplo brevioribus a typo recedit.—*C. bupleurifolia* Seem. Bot. Herald, 279, non Cham. et Schlecht.

Cerro de Pinal, fl. Dec. 1848, *Seemann* 1534.

Specimens collected by Schiede on the Cuesta grande de Chiconquiaco (Herb. Hook., mixed with *C. bupleurifolia*) differ in the appressed indumentum of the stem, but are otherwise similar.

C. sagittalis *L.*; Britten and Baker in Journ. Bot. 1897, 227; Fawcett and Rendle, Fl. Jam. iv. part 2, 10.

San Ignacio: Arroyo del Agua Fria, 400 m., *Gonzalez* 764.

This is a variety or form with narrow leaves and appressed indumentum. A plant collected by Heyde and Lux in Guatemala (*Donnell Smith* 3731), named *C. bupleurifolia* by Micheli, apparently represents the same form. Specimens from Jamaica (*Harris* 11855 and 11965), differ only in the stipules being decurrent.

C. vitellina *J. B. Ker*, Bot. Reg. vi. 447; CNH. xxiii. 437.

Sinaloa (fide Standley).

Vernacular name "Tronador."

Lupinus delicatulus *Sprague et Riley*, sp. nov.; affinis *L. arvensi* Benth., innovationibus et caulibus junioribus patule hirsutis, foliolis pro rata angustioribus apiculatis nec mucronatis, bracteis longioribus, leguminibus fere dimidio angustioribus differt.

Innovationes ferrugineo-hirsutae. *Caules* graciles, inferne lignosi, 2–2·5 mm. diametro, juniores patule hirsuti et pilis brevioribus crispule pubescentes. *Folia* longiuscule petiolata, 5–7-foliolata; petioli 3·5–5 cm. longi, patule vel subappresse pilosi, basi vaginantes; stipulae ad vaginam 4 mm. longam adnatae, parte libera subulata 4–5 mm. longa; foliola oblanceolata, 1·3–2·3 cm. longa, 3·5–6·5 mm. lata, cuspidato-apiculata, longe appresse ferrugineo-ciliata, supra inconspicue appresse-pilosa, subtus glaucescentia manifestius pilosa. *Pedunculi* 7–14 cm. longi, appresse pilosi, juniores crispule etiam pubescentes; rhachis circiter 8 cm. longa. *Bracteae* e basi late obovata 4 mm. longa 3·5 mm. lata abrupte longe caudatae cauda 6 mm. longa, intus glabrae, extra longe pilosae. *Bracteolae* calyci 2 mm. adnatae, anguste lanceolatae, parte libera vix 2·5 mm. longa, 0·6 mm. lata. *Calyx* basi postice gibbosus, extra appresse aureo-pilosus, in toto 7 mm. longus, ad 2·5 mm. supra basin bilobus; labium superius 3·5 mm. longum, apice bifidum lobis subtriangularibus acutis 0·8 mm. longis: labium inferius 4·5 mm. longum, integrum. *Corolla* glabra; vexillum obovato-orbiculare

(ungue brevi late cuneato incluso) 1 cm. longum, 9 mm. latum, apice truncatum, minutissime emarginatum, callis 5 mm. supra basin sitis, 3 mm. longis, 2 mm. disjunctis; alae carinam aequantes, 1 cm. longae, ungue 2 mm. longo, lamina 8 mm. longa circiter 6 mm. lata; carina rostratofalcata. *Tubus stamineus* 5·5 mm. longus; antherae longiores 1·5 mm., breviores 0·5 mm. longae. *Ovula* circiter 9. *Legumen* lineari-oblongum, 2–2·5 cm. longum, 4·5–5 mm. latum, densiuscule ferrugineo-hirsutum.—*L. madrensis* Seem. Bot. Herald, 278, t. 53, pro parte minima.

Sierra Madre, *Seemann* sine numero (type in Herb. Kew), *Seemann* 2185 partim (Mus. Brit.).

Seemann collected two strikingly dissimilar species of *Lupinus* in the Western Sierra Madre, one with very long petioles and 7–10 nearly linear, acuminate leaflets, the other with relatively short petioles and 5–7 oblanceolate, cuspidate-apiculate leaflets. His description and figures of *L. madrensis* were taken mainly from the former, which must be regarded as the type of that species. The following parts of the description and plate of *L. madrensis* refer to the latter, which we have named *L. delicatulus:* "foliolis . . . subovato-oblongis," ". . . legumineque hirsutis," "Legumen about an inch long, 5–6-seeded," "Fig. 1, an entire leaf of a young plant."

L. madrensis and *L. delicatulus* are represented by separate sheets in the Kew Herbarium, the former being numbered 2185, and the latter being without number. In the British Museum there is only a single sheet, which is the type of Seemann's plate. It is numbered 2185, and has a specimen of *L. madrensis* on the top right-hand corner and one of *L. delicatulus* on the bottom left corner.

L. madrensis *Seem.* Bot. Herald, 278 (1856), t. 53 (1854), pro parte maxima.

Sierra Madre, in woods, *Seemann* 2185 (Herb. Kew et Mus. Brit.). Sinaloa, without precise locality, *Gonzalez* 112.

Vernacular name "Piojillo."

Hosackia madrensis *Sprague et Riley*, sp. nov.; affinis *H. gracili* Benth. a qua foliis superioribus etiam saepe 1-jugis, umbellis nunquam foliaceo-bracteatis, alis carinam parum excedentibus tantum, alarum et carinae petalorum lamina basi truncata nec distincte auriculata differt.

Caules graciles, filiformes, flexuosi, glaberrimi. *Folia* petiolata, inferiora trifoliolata, superiora quinquefoliolata; petioli 0·7–1 cm. longi, glabri; stipulae membranaceae, semisagittato-triangulares, acuminatae, 2·5–5 mm. longae, 1–3 mm. latae, integrae, glabrae, majores versus apices ramorum; foliola subsessilia, 6–15 mm. longa, 4–7 mm. lata, ea foliorum inferiorum late obovata apice rotundata, ea foliorum superiorum anguste obovata, subacuta vel apiculata, utrinque glabra, subtus glaucescentia costa brunnea conspicua. *Umbellae* 3–5-florae; pedunculi 3–4·5 cm. longi; pedicelli circiter 1 mm. longi. *Calyx* 6 mm.

longus, brunneo-lineatus; tubus vix 4 mm. longus; labia 2 mm. longa; dentes anteriores subulato-triangulares, 2 mm. longi, posteriores 1–1·3 mm. longi, pro rata latiores. *Vexillum* ungue 5·5 mm. longo, lamina sub angulo recto reflexa panduriformi 6 mm. longa 5 mm. lata apice emarginata septemnervi (nervis exterioribus minimis non inclusis); alae carinam vix excedentes, 1 cm. longae, ungue 5 mm. longo incluso; carina 9 mm. longa, ungue 5 mm. longo, superne valde arcuata (ultra angulum rectum) lamina basi subtruncata. *Tubus staminalis* 8·5 mm. longus. *Ovarium* breviter stipitatum; stylus sub angulo recto inflexus, 2·5 mm. longus.—*H. angustifolia* var. foliis latioribus, floribus pallidioribus, Seem. Bot. Herald 279 (1856); Hemsl. Biol. i. 234, partim.

Sierra Madre, *Seemann* 2180 (type in Herb. Kew.).

Parry and Palmer's no. 140, which Hemsley regarded as convarietal with Seemann's no. 2180, is typical *H. angustifolia* G. Don., which may be distinguished by the more numerous (5–9) appressed-pubescent leaflets and the foliaceous bract subtending the umbel.

Rose questions whether Seemann's plant may not be conspecific with *H. alamosana* Rose (CNH. i. 96; 1891). The material in the Kew Herbarium, however, shows that the two species are not nearly related.

Eysenhardtia polystachya (*Ort.*) *Sarg.* Silva, iii. 29; Safford in Ann. Rep. Smiths. Inst. 1915, 280, tt. 2, 3; N. Am. Fl. xxiv. 35; CNH. xxiii. 433.—*E. amorphoides* H.B.K.; SBH. 279; Hemsl. Biol. i. 236.

Cerro de Pinal, *Seemann* 1535.

Vernacular names "Rosilla," "Palo cuate."

This plant is the source of the Mexican "lignum nephriticum," a wood celebrated in Europe from the sixteenth century. Remarkable fluorescent phenomena are displayed by an infusion of the wood, to which various medicinal virtues have been attributed. A complete account is given by W. E. Safford, l.c.

Dalea Cliffortiana *Willd.* (1803).—*Psoralea Dalea* L. (1753). *P. annua* Mill. (1768), nomen abortivum. *Dalea nigra* Mart. et Gal. (1843). *D. annua* Kuntze (1891). *D. Dalea* MacM. (1892), tautonym. *Parosela nigra* Rose (1906). *P. Cliffortiana* Rose (1906). *Thornbera Dalea* Rydb. in N. Am. Fl. xxiv. 120 (1920). *Dalea elegans*? Hook. et Arn. Bot. Beech. 417 (1840–41); SBH. 280; non Hook. et Arn. (1833).

Cerro de Pinal, fl. Dec. 1848, *Seemann* 1527.

D. crassifolia *Hemsl.* Biol. i. 238 (1880).—*D. pectinata*? SBH. 279; *Parosela crassifolia* Rose; N. Am. Fl. xxiv. 105; CNH. xxiii. 457.

Sierra Madre, *Seemann* 2190.

D. crenulata *Hook. et Arn.*—*Parosela crenulata* Rose; N. Am. Fl. xxiv. 59; CNH. xxiii. 454. *Dalea nutans* Hemsl. Biol. i. 244, partim, non Willd.

Sinaloa (fide Standley).

Vernacular name "Malva prieta."

D. diffusa *Moric.* Pl. Nouv. Am. 8, t. 6 (1833); SBH. 279; Hemsl. Biol. i. 238; Zoe, v. 201.—*Parosela diffusa* Rose; N. Am. Fl. xxiv. 59; CNH. xxiii. 454. *Dalea gracilis* Hook. et Arn. Bot. Beech. 286, non Kunth.

Cerro de Pinal, fl. Dec. 1848, *Seemann* 1524; Cofradia, *Brandegee.*

D. Goldmani (*Rose*) *Riley*, comb. nov.—*Parosela Goldmani* Rose in CNH. viii. 305 (1905); N. Am. Fl. xxiv. 53.

Sierra de Choix, *Goldman* 267.

D. minor (*Rose*) *Brandegee;* Zoe, v. 201.—*Parosela minor* Rose in CNH. viii. 305 (1905); N. Am. Fl. xxiv. 55.

Lodiego, *Palmer* 1624; Cofradia, *Brandegee.*

D. occidentalis (*Rydb.*) *Riley*, comb. nov.—*Parosela occidentalis* Rydb. in N. Am. Fl. xxiv. 115 (1920); CNH. xxiii. 455. *P. platyphylla* Rydb., l.c. *Dalea domingensis* Rose in CNH. i. 96 (1891).

Culiacan and Lodiego, *Palmer* 1783; Fuerte, *Rose, Standley and Russell* 13527.

Standley has reduced *P. platyphylla* to *P. occidentalis.* According to Rydberg's description the former has fewer leaflets and a longer indumentum, and is less densely gland-dotted.

D. Palmeri (*Rose*) *Riley*, comb. nov.—*Parosela Palmeri* Rose; N. Am. Fl. xxiv. 52; CNH. xxiii. 452.

Sinaloa (fide Rydberg and Standley).

D. psoraleoides *Moric.* Pl. Nouv. Am. 5, t. 4 (1833); SBH. 279; *D. verbenacea* var. *sericea* Schlecht. *Parosela psoraleoides* Rose; N. Am. Fl. xxiv. 91; CNH. xxiii. 462. *Dalea verbenacea* Hemsl. Biol. i. 248, non Schlecht. et Cham.

Sierra Madre, *Seemann* 2193.

D. pumila (*Rydb.*) *Riley*, comb. nov.—*Thornbera pumila* Rydb. in N. Am. Fl. xxiv. 120 (1920). *Parosela pumila* Macbride in Contrib. Gray Herb. n.s. lxv. 23 (1922).

Culiacan, *Brandegee.*

D. revoluta *S. Wats.;* Zoe, v. 201.—*Parosela revoluta* Rose. *Thornbera revoluta* Rydb. in N. Am. Fl. xxiv. 119.

San Ignacio: Pueblo de Ajoya, 260 m., *Gonzalez* 46; Los Chilles, 400 m., *Gonzalez* 723. Sinaloa, without precise locality, *Brandegee.*

D. roseiflora (*Rydb.*) *Riley*, comb. nov.—*Parosela roseiflora* Rydb. in N. Am. Fl. xxiv. 105 (1920); CNH. xxiii. 475. *Dalea*

elata (species 21) Hemsl. Biol. i. 239, partim, non Mart. et Gal.
Sierra Madre, *Seemann*.

D. Seemannii *S. Wats.* in PAA. xxii. 470 (1887).—*Parosela Seemannii* Rose; N. Am. Fl. xxiv. 88; CNH. xxiii. 463.
Sierra Madre, *Seemann* (Gray Herb.), *Seemann* 2188 (Herb. Kew).

The type of *D. Seemannii* is a specimen (apparently without number) in the Gray Herbarium collected by Seemann in the Sierra Madre. It is probably a duplicate of Seemann's no. 2188. Both Rydberg and Standley cite *D. Ehrenbergii* Schlecht. as being possibly conspecific, but a study of Schlechtendal's description reveals too many points of difference for their view to be accepted. The leaflets of *D. Seemannii* are rounded or emarginate at the apex, and the glands on the lower surface are conspicuous to the naked eye. *D. Ehrenbergii* has mucronate leaflets, and the glands on the lower surface are hardly visible without a lens. It seems to differ also in the spreading branches, the dense white indumentum of the younger parts, and the larger leaves and leaflets.

D. sericocalyx (*Rydb.*) *Riley*, comb. nov.—*Parosela sericocalyx* Rydb. in N. Am. Fl. xxiv. 63 (1919); CNH. xxiii. 451. *Dalea lachnostachys* Seem. Bot. Herald, 279 (1856), partim; Hemsl. Biol. i. 242, partim; non A. Gray.
Sierra Madre, *Seemann* 2182.

D. similis *Hemsl.;* Biol. i. 246.—*Parosela similis* Rose; N. Am. Fl. xxiv. 80. *Dalea flava* Seem. Bot. Herald, 280, non Mart. et Gal.
Cerro de Pinal, Dec. 1848, *Seemann* 1533.

D. sp.
San Ignacio: Cordon de Balboa, 1060 m., *Gonzalez* 787.
More complete material is required before the species can be satisfactorily determined.

Indigofera discolor *Rydb.* in N. Am. Fl. xxiv. 147 (1923). Lodiego, *Palmer* 1634.

I. mucronata *Spreng.;* Hemsl. Biol. i. 251, excl. syn.; CNH. xxiii. 440.
Sinaloa (fide Standley).

Fawcett and Rendle (Fl. Jam. iv. part 2, 17) follow Grisebach in reducing *I. mucronata* to *I. subulata* Poir., but Urban (Symb. Antill. viii. 281) keeps the two species distinct. Hemsley, followed by Standley, reduced *I. torulosa* Hook. et Arn. to *I. mucronata*, but an examination of the type of the former shows that it is undoubtedly distinct. *I. torulosa* has ascending or suberect torulose legumes, which are distinctly stipitate and terminate in a long acute beak (6–7 mm. long). The leaflets are acute with hairs about 0·3 mm. long. The axes of these hairs are directed outwards at an average angle of 60° with the midrib of the leaf. *I. mucronata* has reflexed non-stipitate non-torulose legumes with much shorter beaks. The leaflets are rounded or

obtuse at the apex. The hairs are 0·6–1 mm. long with axes either nearly parallel to the midrib or diverging at an angle not exceeding 45°. It is difficult to understand how the confusion between the two species arose.

I. salmoniflora *Rose* in CNH. v. 140 (1897); CNH. xxiii. 441.
Ymala, *Palmer* 1695.

I. suffruticosa *Mill.*; CNH. xxiii. 440.—*I. Anil* L.
Occurring nearly throughout Mexico (Standley).
Vernacular name " Añil."

I. truxillensis *H.B.K.*; Rydb. in N. Am. Fl. xxiv. 149. Sinaloa (fide Rydberg).

Brongniartia glabrata *Hook. et Arn.*; CNH. xxiii. 468.
Sinaloa (fide Standley).
Vernacular name " Hierba de Vibora."
The bark and leaves are used as a remedy for rattlesnake bites.

B. Goldmanii *Rose* in CNH. xii. 269 (1909): CNH. xxiii. 469.

Between Las Flechas and La Rastra. *Goldman* 322.
Gonzalez 143 from San Ignacio, R. de los de Ponce, 290 m., may be referred here, judging from Rose's description. The leaflets, however, are mucronate from an acute or obtuse apex, and the peduncles are 1·5–2 cm. long.

Tephrosia Brandegei (*Standley*) *Riley*, comb. nov.—*Cracca Brandegei* Standley in CNH. xx. 217 (1919); CNH. xxiii. 474.
Altata, *Brandegee*.

T. foliolosa (*Rydb.*) *Riley*, comb. nov.—*Cracca foliolosa* Rydb. in N. Am. Fl. xxiv. 162 (1923).
Cerro Colorado, *Brandegee* (U.S. Nat. Herb. 572117).

Tephrosia hypoleuca *Riley*, sp. nov.; affinis *T. nitenti* Benth., foliolis paucioribus oblanceolatis nec oblongis saepius acutis rarius retusis, subtus indumento breviori, floribus multo majoribus distincta.

Caules erecti sulcati, 3 mm. diametro 3 dm. infra apicem, pilis albis ascendentibus satis induti; internodia 7–12 cm. longa. *Folia* 3–7-foliolata, foliola coriacea, oblanceolata, acuta vel obtusa, raro retusa, mucronulata, 4–9·5 cm. longa, 1·2–2·7 cm. lata, terminalia semper majora, juniora supra sericea, vetustiora mox glabrescentia, subtus albido-sericea; petioluli 2–4 mm. longi, 1 mm. diametro. *Racemi* terminales vel axillares, 5–7·5 cm. longi, floribus fasciculatis. *Bracteae* lanceolatae, acuminatae, 0·7–1·3 cm. longae, 1·5–2 mm. latae, albido-pilosae. *Pedicelli* 6–7 mm. longi, sub fructu 1–1·3 cm. longi. *Calyx* campanulatus, 1 cm. longus, dentibus posterioribus e basi triangulari subulatis, sinu 4 mm. alto, dentibus anterioribus triangulari-acuminatis, sinibus 7 mm. altis. *Vexillum* 3·3 cm. longum, 2·8 cm. latum, gradatim in unguem angustatum, apice emarginatum, extra appresse pilosum; alae lamina 2·5 cm. longa 1·4 cm. lata basi truncata, ungue 4 mm. longo; carina acinaciformis, 2·9 cm.

longa, 1·1 cm. lata, apice rotundata, basi in unguem longe ac lenissime angustata. *Tubus staminalis* 2 cm. longus. *Ovarium* 2 cm. longum, appresse pilosum; stylus recurvus, 1·2 cm. longus, postice barbatus. *Legumen* recurvum, circiter 8 cm. longum, (stylo persistente excluso), 6 mm. latum, compressum, marginibus incrassatis. *Semina* 12–13.—*T. sericea* Seem. Bot. Herald, 280 (1856), a *lapsus calami* for *T. nitens* Benth. *T.* sp. (*T. nitens* Seem.?) Hemsl. Biol. i. 258; non *T. nitens* Benth. ex Seem. (1853).

Sierra Madre, *Seemann* 2192 (type in Herb. Kew).

T. madrensis *Seem.* Bot. Herald, 280 (1856); Hemsl. Biol. i. 258.—*Galactia marginalis* Seem. l.c. t. 61, non Benth. *Cracca madrensis* Kuntze; CNH. xxiii. 472.

Sierra Madre, *Seemann* 2186.

T. multifolia *Rose* in CNH. i. 320 (1895); Brandegee in Zoe, v. 201.—*Cracca toxicaria* Standley in CNH. xxiii. 473, partim, non Kuntze.

Cerro Colorado, *Brandegee*

Brandegee states that his plant is not typical, having the leaves more acuminate, and cuneate at the base. Standley reduces *T. multifolia* Rose to *Cracca toxicaria* (Pers.) Kuntze. A comparison of Palmer's no. 1364 (the type-number of *T. multifolia*) with specimens of *Cracca toxicaria* shows that the former differs in the leaflets being oblong and not oblong-lanceolate, in their more delicate texture and shorter, sparser indumentum, and in the much slenderer leaf-rhachis. It seems desirable to treat *T. multifolia* as a distinct species.

Tephrosia pachypoda *Riley*, sp. nov.; affinis *T. lanatae* Mart. et Gal., sed foliis longioribus 7–11-foliolatis, foliolis majoribus nec basi subcordatis, racemis longioribus et laxioribus, bracteis multo minoribus, calycis corollaeque indumento nunquam appresso, calycis dentibus haud subulato-acuminatis differt.

Caules sulcati, dense fulvo-pilosi, 5 mm. diametro 2 dm. infra apicem; internodia 2–3·5 cm. longa. *Folia* 2·4–2·7 dm. longa, 7–11-foliolata; foliola crasse petiolulata, elliptica vel oblongo-elliptica, 8–12 cm. longa, 2·5–5·5 cm. lata, apice obtusa vel rotundata, plerumque apiculata, basi rotundata, supra viridia, glabra, juniora pilosa, subtus dense fulvo-pilosa; petioluli laterales 4–6 mm longi, 2–3 mm. diametro; petiolulus terminalis ad 1·5 cm. longus; stipulae ovatae, apice rotundatae, 5 mm. longae, 3 mm. latae. *Racemi* ad 2 dm. longi, sub fructu ad 3 dm. longi, dense fulvo-pilosi. *Bracteae* lanceolato- vel subulato-acuminatae, 3–5 mm. longae, pilis fulvis patentibus dense obtectae. *Pedicelli* 5–6 mm. longi. *Calyx* campanulatus, 9 mm. longus, fulvo-pilosus, dentibus triangulari-acuminatis, tubo 5 mm. longo, dentibus posterioribus 2·5 mm. longis, anterioribus subaequalibus 3–4 mm. longis. *Vexillum* ungue 3 mm. longo, lamina suborbiculari 1·3 cm. longa 1·2 cm. lata apice truncata extra pilosa; alae ungue 3 mm. longo, lamina oblonga 1 cm. longa 4 mm. lata

glabra apice rotundata basi auriculata; carina ungue 3·5 mm. longo, lamina forma asciae 1·2 cm. longa 6 mm. lata. *Tubus staminalis* 1·2 cm. longus, glaber. *Ovarium* 1·2 cm. longum, pilosum, 8-ovulatum; stylus sub angulo recto inflexus, 6 mm. longus, barbatus. *Legumen* rectum, lineare, 5 cm. longum, 6 mm. latum, dense fulvo-pilosum. *Semina* compressa, ad 4 mm. longa, 3 mm. lata, brunnea, nigro-variegata.—*T. crassifolia* Seem. Bot. Herald, 280 (1856); Hemsl. Biol. i. 257, partim; non Benth.

Sierra Madre, *Seemann* 2183 (type in Herb. Kew).

T. purpurea (*L.*) *Pers.*—*Cracca purpurea* L.; Rydb. in N. Am. Fl. xxiv. 179.

Sinaloa (fide Rydberg).

T. rhodantha *Brandegee* in Zoe, v. 201 (1905).—*Cracca rhodantha* Rose; CNH. xii. 270; CNH. xxiii. 472.

Cofradia, *Brandegee*; Lodiego, *Palmer* 1619.

T. Seemannii (*Britten et E. G. Baker*) *K. Schum.*—*Cracca Seemannii* Britten et E. G. Baker in Journ. Bot. 1900, 17; CNH. xxiii. 473. *Tephrosia virginiana* Seem. Bot. Herald, 280 (1856); Hemsl. Biol. i. 258; non Pers.

Sierra Madre, in woods, *Seemann* 2191.

Vernacular name "Gallitos."

T. submontana (*Rose*) *Riley*, comb. nov.—*Cracca submontana* Rose in CNH. viii. 46 (1903); CNH. xxiii. 473. *Tephrosia leucantha* Seem. Bot. Herald, 280 (1856); Hemsl. Biol. i. 257, partim; non H.B.K.

Cerro de Pinal, fl. and fr. Dec. 1848, *Seemann* 1532.

T. talpa *S. Wats.* in PAA. xxii. 405 (1887).—*Cracca talpa* Rose; CNH. xxiii. 473.

Sinaloa (fide Standley).

T. toxicaria *Pers.*; Mart. Fl. Bras. xv. pars 1, 46, t. 8; Zoe, v. 201; Fawcett and Rendle, Fl. Jam. iv. part 2, 18; Urb. Symb. Antill. viii. 283.—*Cracca toxicaria* Kuntze; CNH. xxiii. 473.

Cofradia and Cerro Colorado, *Brandegee*.

"Surinam Poison." The plant is said to have been used in the treatment of cutaneous diseases, to have purgative properties, and to affect the heart in the same manner as digitalis. It is used as a fish-poison, and is reported to yield a blue dye.

Gliricidia Lambii *Fernald* in Bot. Gaz. xx. 533 (1895).

Rosario: in the valley of Rio Rosario, *Lamb* 451; also observed along the stage road between Rosario and Santiago.

Vernacular name "Cacaguananchi."

Standley (CNH. xxiii. 482) evidently considers *G. Lambii* conspecific with *G. sepium*. I have seen no authenticated specimens of *G. Lambii*, but a careful comparison of Fernald's description with material of *G. sepium* reveals so many points

of difference that it is difficult to see any reason for uniting the two species.

G. sepium (*Jacq.*) *Steud.;* CNH. xxiii. 482.—*Robinia sepium* Jacq. *Gliricidia maculata* H.B.K.

Sinaloa (fide Standley).

Vernacular name "Cacahuananche."

Often planted to protect cacao and coffee plantations.

Diphysa occidentalis *Rose* in CNH. xii. 271 (1909); CNH. xxiii. 479.

Culiacan, *Palmer* 1498.

[**D. racemosa** *Rose* in CNH. i. 97, t. 3 (1891); CNH. xxiii. 478.

Judging from the distribution given by Standley—Sonora to Guerrero and Morelos—*D. racemosa* may occur in Sinaloa.]

D. Thurberi (*A. Gray*) *Rydb.;* CNH. xxiii. 479.—*Daubentonia Thurberi* A. Gray. *Diphysa echinata* Rose in CNH. xii. 271 (1909).

Between Rosario and Colomas, *Rose* 1603.

D. sp. nov.

San Ignacio; Los Sabinos, 490 m., *Gonzalez* 258.

Conspecific with *Lamb* 520 from Acaponeta, Tepic, which was distributed as *D. racemosa* Rose. The material is too incomplete for description.

Coursetia mollis *Robinson et Greenman;* CNH. xxiii. 481.

Sinaloa (fide Standley).

Vernacular names "Garbancillo de la costa", "Cucablanca."

[**C. glandulosa** *A. Gray;* CNH. xxiii. 481.

According to Standley the range of this species is from Lower California and Sonora to Guerrero, hence it probably occurs in Sinaloa.]

Willardia mexicana (*S. Wats.*) *Rose;* CNH. i. 98; CNH. xxiii. 483.—*Coursetia mexicana* S. Wats. in PAA. xxi. 424 (1886).

Sinaloa (fide Standley).

Vernacular names "Nesco," "Palo piojo," "Taliste."

A decoction of the bark is used to destroy parasites on cows and horses.

Cracca Edwardsii *A. Gray*, Pl. Wright. ii. 35 (1853); CNH. i. 321.

Agiabampo, *Palmer* 787.

Standley (CNH. xxiii. 477) treats this species as a synonym of *Cracca mollis* Benth.

Sesbania macrocarpa *Muhl. ex Elliott;* Standley in CNH. xxiii. 477, excl. syn.—*S. macrocarpa* var. *picta* S. Wats. in PAA. xxiv. 46 (1889); CNH. i. 321; sed non *Aeschynomene picta* Cav.

Agiabampo, *Palmer* 775.

Vernacular name "Bequilla."

Aeschynomene picta Cav. Ic. iv. 7, t. 314 (1797), which is treated as a synonym of *S. macrocarpa* by Standley, differs

notably in the torulose pod and fewer leaflets, and should be referred to *S. aegyptiaca* Pers.

Nissolia guatemalensis *Rose* in CNH. v. 162 (1899); CNH. xxiii. 488.
Sinaloa (fide Standley).

N. hirsuta *DC.;* CNH. v. 160, fig. 22; CNH. xxiii. 488.
Culiacan, *Palmer* 1496.

N. Nelsoni *Rose* in CNH. v. 162, fig. 26 (1899); CNH. xxiii. 488.
San Ignacio; R. del Palmarito, 210 m., *Gonzalez* 633.
Vernacular name "Riatilla."
Standley doubts whether this is distinct from *N. fruticosa* Jacq. I see little resemblance between it and Jacquin's figure (Sel. Stirp. Am. Hist. t. 179, fig. 44; 1763).

N. Schottii (*Torr.*) *A. Gray;* CNH. v. 158, fig. 18; CNH. xxiii. 488.—*Chaetocalyx Schottii* Torr. Bot. Mex. Bound. 56, t. 18 (1859).
Sinaloa (fide Standley).

Aeschynomene acapulcensis *Rose* in CNH. v. 191 (1899); Zoe, v. 201.
Cerro Colorado, *Brandegee.*

A. americana *L.;* CNH. xxiii. 490.
Sinaloa (fide Standley).

A. amorphoides (*S. Wats.*) *Rose;* PAA. xxix. 315; CNH. i. 321; Zoe, v. 202; CNH. xxiii. 491.—*Brya amorphoides* S. Wats. in PAA. xxii. 406 (1887).
Cerro Colorado, *Brandegee.*

A. bracteolaris *Riley* in Kew. Bull. 1923, 115.
San Ignacio; El Coacoyol, 460 m., *Gonzalez* 586.

A. fascicularis *Cham. et Schlecht.;* CNH. i. 321; CNH. xxiii. 491.
Agiabampo, *Palmer* 808.

A. fruticosa *Rose* in CNH. v. 192 (1899); CNH. xxiii. 491.
Topolobampo, *Palmer* 204.

A. hispida *Willd.;* CNH. i. 321; CNH. xxiii. 490.
Agiabampo, *Palmer* 775 a. Also Sinaloa (fide Standley).

A. petraea *Robinson* in PAA. xxvii. 166 (1892); CNH. xxiii. 491.
Sierra Madre, *Seemann* 2189.

A. simulans *Rose* in CNH. v. 192 (1899); CNH. xxiii. 491.
Between Rosario and Colomas, *Rose* 1616.

Stylosanthes viscosa *Swartz;* Hemsl. Biol. i. 273.
Cerro de Pinal, *Seemann* 1540.

Zornia diphylla *Pers.;* Hemsl. Biol. i. 273; Zoe, v. 202.—*Z. reticulata* Sm.; SBH. 280.
Cerro de Pinal, fr. Dec. 1848, *Seemann* 1529. Also without locality, *Brandegee.*

Desmodium chartaceum *Brandegee* in Zoe, v. 202 (1905). *Meibomia chartacea* Standley; CNH. xxiii. 487.

Cerro Colorado, *Brandegee*. San Ignacio; Arroyo de los Frailes, 820 m., *Gonzalez* 747.

I have seen no authenticated specimens of *D. chartaceum*, but Gonzalez's plant agrees with Brandegee's description except that it possesses relatively narrower leaflets.

D. gramineum *A. Gray;* Zoe, v. 202.

Cerro Colorado, *Brandegee*.

D. madrense *Hemsl.* Biol. i. 282 (1879).—*D. canadense* Seem. Bot. Herald, 280 (1856), non DC.

Sierra Madre, *Seemann* 2184. San Ignacio; Cerro de la Silla, 1200 m., *Gonzalez* 732, partim.

The material received at Kew from Señor Gonzalez under No. 732 comprised two species—*D. madrense*, and an apparently undescribed species which differs in the caudate-acuminate bracts, acutely acuminate leaflets and the indumentum.

D. orbiculare *Schlecht.;* Zoe, v. 202.—*Meibomia orbicularis* Kuntze; CNH. xxiii. 486.

Cerro Colorado, *Brandegee*.

D. plicatum *Cham. et Schlecht.;* Hemsl. Biol. i. 286.—*Meibomia plicata* Kuntze; CNH. xxiii. 486.

Sierra Madre, *Seemann* 2181.

D. rubricaule (*Rose et Painter*) *Riley*, comb. nov.—*Meibomia rubricaulis* Rose et Painter in Bot. Gaz. xl. 145 (1905); CNH. xxiii. 486.

San Ignacio: La Nevada, 890 m., *Gonzalez* 558.

Cicer arietinum *L.;* CNH. v. 213.

The seeds are sold in the market at Mazatlan, according to Rose.

Centrosema sagittatum (*H. et B.*) *Brandegee* in Zoe, v. 202.—*Glycine sagittata* H. et B. ex Willd. Enum. Hort. Berol. 757 (1809). *Rudolphia dubia* H.B.K. Nov. Gen. et Sp. vi. 432, t. 591 (1823). *Centrosema hastatum* Benth. in Ann. Wien. Mus. ii. 120 (1838). *C. dubium* Hemsl. Biol. i. 294 (1880). *Bradburya sagittata* Rose in CNH. viii. 46 (1903); CNH. xxiii. 505.

Cofradia, *Brandegee*. Without locality, *Gonzalez* 582.

Clitoria Ternatea *L.;* Mart. Fl. Bras. xv. pars 1, 118, t. 31, fig. 1; CNH. v. 168.

In cultivation at Rosario, *Rose* 1598.

Cologania angustifolia *Kunth*, Mimos. 209, t. 58 (1819); Rose in CNH. viii. 37.

Foothills of Sierra Madre near Colomas, *Rose* 1653.

Erythrina flabelliformis *Kearney;* Standley in CNH. xx. 181; CNH. xxiii. 501.—*E. coralloides* Rose in CNH. i. 322 (1895), non DC.

Agiabampo, *Palmer* 771.

Vernacular name "Pioneo."

Standley (l.c.) questions whether *E. coralloides* DC. may not be

conspecific with *E. americana* Mill. or *E. flabelliformis* Kearney. In my view, Mociño and Sessé's plate 253, upon which De Candolle based *E. coralloides*, bears no resemblance to the authenticated specimens of *E. americana* or *E. flabelliformis* at Kew. I have not seen the Palmer number, but follow Standley who cites it as the latter species.

E. occidentalis *Standley* in CNH. xx. 180 (1919); CNH. xxiii. 500.

Mazatlan, *Rose, Standley and Russell* 13725; Rosario, *Rose* 1592, 1822; near Colomas, *Rose* 1796; Guadalupe, *Rose, Standley and Russell* 14732; Culiacan, *Brandegee*; La Rastra, *Goldman* 365.

Vernacular name "Colorín."

Galactia incana (*Rose*) *Standley;* CNH. xxiii. 502.—*Odonia incana* Rose in CNH. x. 102, t. 32 (1906).

Sinaloa (fide Standley). Without locality, *Gonzalez* 496.

I have seen no authenticated specimens of *G. incana*. In comparison with the plate, Gonzalez' plant differs in having somewhat narrower acuminate leaflets, a longer-clawed vexillum, alae with larger auricles, and a sericeous rather than pubescent ovary.

Canavalia acuminata *Rose;* Zoe, v. 202; Standley in CNH. xxiii. 494.

Culiacan and Cofradia, *Brandegee*.

According to Standley (l.c.) *C. acuminata* is known only from Manzanillo. It does not appear whether he has overlooked Brandegee's record or considers that the determination was incorrect.

C. villosa *Benth.;* CNH. xxiii. 495.

Sinaloa (fide Standley).

Vernacular name "Frijolillo."

Phaseolus acutifolius *A. Gray;* SBH. 281.

Sierra Madre, *Seemann*. Choix; Tasajera, 490 m., *Gonalez* 870.

Vernacular name "Ejotillo."

I have not seen Seemann's specimen.

P. rubescens *Brandegee;* Zoe, v. 203.

Common on the low lands west of Culiacan, *Brandegee*.

Rhynchosia minima (*L.*) *DC.;* CNH. i. 322.—*Dolicholus minimus* Medic.; CNH. xxiii. 497.

Agiabampo, *Palmer* 789.

R. phaseoloides (*Swartz*) *DC.*—*Dolicholus phaseoloides* Kuntze; CNH. xxiii. 497.

Sinaloa (fide Standley).

Vernacular name "Ojo de zanate."

R. rupicola *Brandegee* in Zoe, v. 202 (1905).

Among rocks of the highest elevations of the Cerro Colorado, *Brandegee*.

According to Brandegee the plant is so glutinous that the stems stick together when collected. He describes it as differing from most species of *Rhynchosia* in having branched racemes and in the attachment of the funicle at one end of a linear hilum.

Eriosema diffusum (*H.B.K.*) *G. Don;* CNH. xxiii. 495.—*Glycine diffusa* H.B.K. Nov. Gen. et Sp. vi. 420, t. 572.

Sinaloa (fide Standley).

Vernacular name "Hierba del duende."

E. grandiflorum (*Cham. et Schlecht.*) *Seem.;* SBH. 345; CNH. xxiii. 495.—*Rhynchosia grandiflora* Cham. et Schlecht.

Cerro de Pinal, fl. Dec. 1848, *Seemann* 1531. San Ignacio; Mesa de la Higuera, 760 m., *Gonzalez* 602.

Vernacular names "Jarilla Serrana", "Jarilla de la Sierra."

Lonchocarpus lanceolatus *Benth;* CNH. xx. 73, text fig. 23, t. 5, fig. C; CNH. xxiii. 513.

Ymala, *Palmer* 1433; between Rosario and Acaponeta, *Rose* 1873.

Vernacular name "Cabo de hacha."

L. megalanthus *Pittier* in CNH. xx. 70, fig. 19 (1917); CNH. xxiii. 513. Sinaloa (fide Standley).

L. sericeus (*Poir*) *H.B.K.*; CNH. xx. 82, fig. 33; CNH. xxiii. 514.

Between Rosario and Concepción, *Rose* 3268.

Piscidia mollis *Rose* in CNH. i. 98 (1891).—*Icthyomethia mollis* Blake in Journ. Wash. Acad. Sc. ix. 246 (1919); CNH. xxiii. 511.

Sinaloa (fide Standley).

Vernacular name "Palo blanco."

XXXIV.—THE BACTERIAL NODULES OF THE RUBIACEAE.

L. A. Boodle.

Trimen, in his Handbook of the Flora of Ceylon (1894, part 2, p. 349 *et seq.*), describes the leaves of *Pavetta indica* L. as having "scattered large thickened warts more prominent above than beneath." He also mentions warts on the leaves of *Pavetta angustifolia* Thw., *P. involucrata* Thw. and *P. Gleniei* Thw.

Similar warts or nodule-like thickenings occur on the leaves of some other members of the *Rubiaceae*, and it has been known for many years that these leaf-nodules contain Bacteria, Zimmermann having established this fact in 1902 (Jahrb. f. wiss. Bot., vol. 37, p. 1) with regard to *Pavetta indica*, *P. angustifolia* and two other species.

At a later date a further study of the nodules and of the Bacteria inhabiting them was made by von Faber (Jahrb. f. wiss. Bot., vol. 51, 1912, p. 285, and ibid., vol. 54, 1914, p. 243),

who made the interesting discovery that the Bacteria of the nodules are capable of fixing free nitrogen from the air. The plants investigated were four species of *Pavetta* and one species of *Psychotria* (*P. bacteriophila* Val.).

It appears that the presence of Bacterial nodules is a constant feature of those species in which they have been found, and the explanation of this is supplied by von Faber, who demonstrated the occurrence of Bacteria in the seed, between the embryo and the endosperm. The seedling is therefore infected from the first. The Bacteria establish themselves in the leaf-buds, in a gummy secretion within the stipular sheath, and infect the young leaves in the bud, entering them through certain stomata, which are formed at a rather early stage and are connected with secretory cavities in the mesophyll. In the region of each point of entry of the Bacteria, the mesophyll develops into a special enlarged lacunar tissue, the intercellular spaces of which become occupied by the Bacteria, the leaf becoming locally thickened owing to the special growth of mesophyll-tissue.

The *Bacterium* of the nodules, which has been named *Mycobacterium Rubiacearum*, was grown by von Faber in certain nutrient media, and a gain of nitrogenous material was found in the cultures, proving fixation of nitrogen by the *Bacterium*, when growing apart from its host plant. Some recent work by Rao (Agric. Journ. of India, vol. 18, part 2, 1923, p. 132) on Bacterial nodules of *Rubiaceae* confirms the fixation of nitrogen by the *Bacterium*, and deals especially with *Chomelia asiatica*, in which the nodules had not before been examined.

It is possible by suitable treatment of seeds with hot water to kill the Bacteria in them without destroying the germinative power of the seeds. In this way von Faber raised some seedlings (of *Pavetta Zimmermanniana*, Val.) free from Bacteria, and consequently without typical nodules, and afterwards induced the formation of nodules by infecting the plants from cultures of the nodule-*Bacterium*. In other experiments the efficiency of the Bacteria in the nodules in supplying nitrogenous material was made evident by comparing the condition of two lots of seedlings, one having Bacterial nodules, the other not, and both being grown on a substratum containing no nitrogenous compounds.

A relatively large amount of nitrogenous material accumulates in the nodules, as may be shown by staining them with Millon's reagent, but this accumulation may disappear from the nodules of old leaves, and apparently the Bacteria may be eventually digested by the host-plant (von Faber, loc. cit., vol. 51, p. 301).

On account of the nitrogen-fixing activity of the Bacteria and what has been noted with regard to the contents of the nodules, one may assume that the leaves (when not too old) of those species of *Rubiaceae* which have Bacterial nodules will contain a rather high percentage of nitrogenous substance. The suitability of such leaves for use as green manure therefore suggests itself, and

in this connection it appears very significant that the leaves of *Pavetta indica* are used in this way by natives in India (see von Faber, loc. cit., vol. 51, p. 336), and that leaves of the same species and of *Chomelia asiatica* " are in high esteem as green-leaf manures among the Tamil cultivators of Ceylon (northern districts) " according to Rao (loc. cit., p. 142). The leaves are gathered from wild plants in the jungle.

Foliar nodules containing Bacteria but differing in several respects from the nodules of the *Rubiaceae* occur in *Ardisia crispa* A. DC. (*Myrsinaceae*) and have been investigated by Miehe (Abh. Sächs. Ges. Wiss., vol. 32, p. 399; Jahrb. f. wiss. Bot., vol. 53, p. 1, and vol. 58, p. 29).

XXXV.—NOTES ON HELIOCARPUS.

T. A. Sprague.

The publication of a revision of the genus *Heliocarpus* (*Tiliaceae*) by Mr. E. E. Watson* suggests the following remarks which are based on a study of the material in the Kew Herbarium.

H. glanduliferus Robins. in Contrib. U.S. Nat. Herb. v. 127 (1897).—*H. americanus* Hemsl. Biol. Centr.-Amer., Bot. i. 139, partim, non L.
Guatemala: Dep. Santa Rosa; Chupadero, 1500 m. *Heyde et Lux in Donn. Smith* 3956. Volcan de Fuego; ridge above Calderas, 2490 m., *Salvin.*

Mr. Watson takes a comprehensive view of *H. glanduliferus*, and cites *H. glabrescens* Hochr. as a synonym. The latter differs at first sight from type *glanduliferus* in the practically glabrous leaves with a very narrow basal sinus and a more strongly areolate lower surface. Mr. Watson describes the indumentum of the lower surface of the leaf of *H. glanduliferus* as " varying from essentially glabrous to densely and softly stellate," and Salvin's specimen of *H. glanduliferus* from the Volcan de Fuego is admittedly somewhat intermediate as regards the indumentum. Some of the most important specific characters in *Heliocarpus*, however, are afforded by the mature fruit, which does not appear to be known in the case of *H. glabrescens*, and in the present state of our knowledge it seems premature to unite the two species.

Mr. Watson has overlooked my identification of *H. glabrescens* with *Adenodiscus mexicanus* Turcz.—not unnaturally, since it was published in the introduction to a Revision of the genus

* Bull. Torr. Bot. Cl. 1923, pp. 109–128.

Belotia.* The species should now be known as *H. mexicanus*. Its synonymy and geographical distribution are as follows :—

H. mexicanus (*Turcz.*) *Sprague* in Kew Bull. 1921, 272.—*Adenodiscus mexicanus* Turcz. in Bull. Soc. Nat. Mosc. 1846, ii. 504. *Heliocarpus glabrescens* Hochr. in Ann. Conserv. et Jard. Bot. Genève, xviii.–xix. 122 (1914). *H. americanus* Hemsl. Biol. Centr.-Amer., Bot. i. 139, partim, non L.
Mexico: Vera Cruz; woods on the Cordillera, 900 m., *Galeotti* 4154; Zacuapan, *Linden* 858; Oaxaca, *Ghiesbreght* 51.

In describing *H. glanduliferus*, Robinson cited, in addition to the type-material from Guatemala, specimens collected by E. W. Nelson in Chiapas, and others collected by A. Tonduz in Costa Rica at S. Francisco de Guadalupe, by the Rio Torres. I have not seen this syntype† material, but there are specimens in the Kew Herbarium from the same locality, named *H. glanduliferus*. These differ from type *glanduliferus* in the relatively narrower, more lanceolate leaves, in the cymes, which are opposite the foliage-leaves instead of being aggregated into a leafless terminal inflorescence, and in the flower-buds, which are more swollen above and are terminated by strongly diverging curved horns. The characters mentioned seem to warrant the treatment of the Costa Rica plant as an independent species.

H. costaricensis *Sprague*, sp. nov.; affinis *H. glandulifero* Robins., forma foliorum et alabastrorum necnon inflorescentia differt.

Folia ovato-lanceolata vel lanceolata, longe acute acuminata, basi rotundata vel inconspicue anguste cordatula, 9–12 cm. longa, 3–6 cm. lata, supra asperule stellato-pilosa, pilis praecipue biradiatis vel triradiatis nonnullis simplicibus hic inde sparsis, radiis curvato-ascendentibus, subtus densius stellato-pilosa radiis pluribus; petioli 2·5–4·5 cm. longi. *Cymae* plerumque oppositifoliae, nec inflorescentiam terminalem aphyllam efformantes. *Alabastra* in sicco circiter 5 mm. longa cornubus inclusis, inferne circiter 1·2 mm. diametro, deinde valde inflata, juxta medium ultra 2 mm. diametro; cornua valde divergentia, curvata, circiter 0·7 mm. longa. *Sepala* oblongo-linearia, 6·5–7·5 mm. longa, 1 mm. lata, cornua 0·75–1 mm. longa. *Petala* anguste oblanceolata, 4–4·5 mm. longa, 1 mm. lata vel ultra. *Stamina* circiter 40. Costa Rica: Prov. San José: banks of the Rio Torres, at San Francisco de Guadalupe, 1100 m., *Pittier in Herb. Tonduz* 13022 (*Herb. Donn. Smith* 7451).

Heliocarpus reticulatus Rose and *H. microcarpus* Rose, which are united by Mr. Watson, differ notably in the fruit. In the former the sides of the fruit are clothed with conspicuous plumose

* Kew Bull. 1921, 272.
† The terms now in use for the various kinds of types are explained in Journ. Bot. 1923, 137.

bristles resembling the peripheral ones but shorter, whereas in the latter the bristles on the faces are very short or almost suppressed. The former is represented in the Kew Herbarium from Jalisco only, and the latter from Morelos only. The reasons given by Mr. Watson* for uniting the two species do not seem adequate.

H. appendiculatus *Turcz.* in Bull. Soc. Nat. Mosc. 1858, i. 226.

Mr. Watson cites numerous specimens from San Luis Potosi, Vera Cruz, Chiapas, and Guatemala in addition to the type, which is *Linden* 2065 from Tabasco. Mature fruit of the Tabasco plant is not known, and it is therefore difficult to determine whether the specimens from Guatemala are really conspecific. An allied species from Chontales, Nicaragua, is represented in the Kew Herbarium. This differs from the Guatemalan plant in the much smaller capsule, only 8–9 mm. wide including the bristles, and with a broadly elliptic body, rounded above, and a shorter stipe. These differences are not due to age, as the seeds are ripe in both cases. The Nicaraguan plant may be distinguished from *H. appendiculatus* (both Tabasco and Guatemala specimens) by the indumentum of the lower surface of the leaf, which has numerous relatively large fulvous stellate hairs forming a second tier above the fine greyish tomentum. It may be known as *H. chontalensis*.

H. chontalensis *Sprague*, sp. nov.; affinis *H. appendiculato* Turcz., staminibus paucioribus, capsula minore brevius fimbriata, indumento duplici paginae inferioris folii cognoscendus.

Folia late ovata, indivisa vel subtrilobata, 8–14 cm. longa, 6–11·5 cm. lata, breviter acuminata, basi leviter cordata, auriculata, auriculis lobatis, lobis nectariis terminatis, supra minute densiuscule asperule stellato-pubescentia, subtus griseo-tomentella, pilis stellatis majoribus fulvis superpositis; petioli 4–7·5 cm. longi. *Inflorescentia* densiuscula, rhachi furfuraceo-tomentosa. *Alabastra* circiter 4·5 mm. longa, haud cornuta. *Sepala* oblongo-linearia, 5·5 mm. longa, 1 mm. lata. *Petala* linearioblanceolata, 3·5–4·5 mm. longa, ungue ciliato 0·75–1 mm. longo incluso. *Stamina* circiter 25. *Capsula* cum radiis 8–9 mm. lata, 5 mm. stipitata; corpus capsulae late ellipticum, 2·5–2·75 mm. longum, 2·2 mm. latum; radii 2·5–4·5 mm. longi, circiter 52–56; setae stipitis 9–10. *Semina* 1–2.—*Heliocarpus* sp. no. 6, Hemsl. Biol. Centr.-Amer., Bot. i. 139; *H. arborescens* Hemsl. l.c., partim, non Seem.

Nicaragua: Chontales; in forests, 600 m., *Lévy* 483 (type); *Tate* 31 (384), 31 (384 ?).

Dissection of the flower-bud of *H. arborescens* Seem., which Watson has excluded from *Heliocarpus*, shows that it belongs to the genus *Triumfetta*. The globose spinose-tuberculate ovary, long slender style and small acute stigmas are characters which, taken in conjunction with the ciliate annulus surrounding the

* Bull. Torr. Bot. Cl. 1923, p. 112.

stamens, may be regarded as conclusive. The species should therefore be known as *Triumfetta arborescens* (Seem.). Its synonymy and geographical distribution are as follows :—

Triumfetta arborescens (*Seem.*) *Sprague*, comb. nov.—*Heliocarpus arborescens* Seem. Bot. Herald, 86 (1853); Hemsl. Biol. Centr.-Amer., Bot. i. 139, partim, excl. spec. Nicarag.
Panama : Canton of Natá; on the banks of the Rio de Santa Maria, *Seemann* 96.

XXXVI.—MISCELLANEOUS NOTES.

F. W. Birschel.—Among the smaller collections of dried plants included in Sir W. J. Hooker's herbarium which, along with Bentham's, formed the basis of the present Kew Herbarium, was one comprising about 200 specimens collected near Caracas, Venezuela, by F. W. Birschel. Birschel, who was a Hanoverian by birth, was employed as a gardener in the Royal Gardens, Kew, for about two years, 1852–3. He visited Venezuela in 1854—some of his specimens have signed and dated labels (e.g. *Melochia tomentosa* and *Waltheria americana*), but many are marked merely " Caracas. Birschel." On his return to England about 1855 he stayed for a few months in the Royal Gardens, Kew, and then obtained an appointment under Sir Joseph Paxton at Chatsworth, where he remained for about two years. In April 1858 he was appointed Curator of Liverpool Botanic Gardens, where he remained some two or three years. He died in Liverpool a few years later. In the collection of letters preserved in the Kew Herbarium is one from Birschel to Sir W. J. Hooker, dated April 1, 1858, asking for a testimonial in connection with his Liverpool appointment. Most of the facts as to Birschel's life are taken from a notice by the late Mr. W. B. Latham in the *Journal of the Kew Guild*, 1901, ix. 38. Mr. Latham gave Birschel's first initial as J., but the signature of the letter to Hooker is unmistakeably F. W. Birschel. Latham made Birschel's acquaintance " about 1855, on his return to Kew from a botanical mission to Brazil," and they were fellow-workers both at Kew and Chatsworth. " Brazil " is doubtless a mistake for " Venezuela."

It has seemed worth while to put on record what is known of Birschel, as his name does not appear in the " Biographical Index of British and Irish Botanists," nor in the list of collectors whose plants are in the Kew Herbarium (Kew Bull. 1901, pp. 1–80). It has sometimes been misread as " Buschel " (*cf.* Journ. Bot. 1919, Suppl., p. 23, under *Manettia calycosa*).

T. A. S.

Text-book of Australian Forest Botany.*—Notebooks of student-days are soon outgrown : they are bulky, possess no index and too often are far from ideal in arrangement and neat-

* An Elementary Text-book of Australian Forest Botany, by C. T. White. Vol. I. Forestry Commission, Sydney, New South Wales.

ness. Their original value is of short duration, however, and their long retention becomes unnecessary when one possesses text-books of the type of Mr. White's. This is an excellent work of reference and its clear arrangement and handy size should also commend it. This work must, however, be regarded rather as a lecture-companion and reference-book than as a " self-educator."

The book possesses 208 pages and is divided up into three sections—(1) morphology (pp. 5–119), (2) anatomy (pp. 129–143), and (3) physiology (pp. 162–208). It is to be regretted that morphology occupies more than half the book. It is not suggested that this part is too large. It is a most excellent introduction to work with a Flora. But forestry being in many of its aspects " applied ecology," and as forestry is generally conducted for the supply of wood, it seems reasonable to expect the greatest detail to be given to the most important parts—the internal structure and life processes. In the preface the author apologises —and with reason—for the abundance of terms used in the morphological section, but he makes ample amends by giving derivations of the words in the form of foot-notes and by adding a useful index. Mr. N. W. Jolly, B.A., B.Sc., contributes largely to the section devoted to physiology, and this, as well as the section on anatomy, is good, but rather too concise for the beginner and for the man trying to educate himself. On the whole the work is well illustrated by photographs and line illustrations of a helpful nature. Most of these are clear, but a few of the latter are certainly not in keeping with the high standard of the remainder of the work. The second volume will be awaited with interest. In the preface the author says it will be devoted to systematic botany, ecology and the identification of timbers. It is hoped that the importance of the tree as a wood producer will not be lost sight of, for all foresters require to know the essentials of tree life while only a few will specialise in taxonomy.

K. W. B.

The Botanic Gardens, Dominica.*—In *Kew Bull.* 1915, p. 311, mention was made of the Official Guide to the Botanic Gardens, Dominica. A second edition has recently been published in which the information has been brought up to date and considerably amplified, and through setting the lines more closely it has been possible to keep the Guide to a convenient pocket size. In particular the illustrations have been greatly improved not only in the manner of reproduction but in the choice of subjects.

* Official Guide to the Botanic Gardens, Dominica, plates 10, plan, pp. 59 and xvi. Price 1*s*.

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